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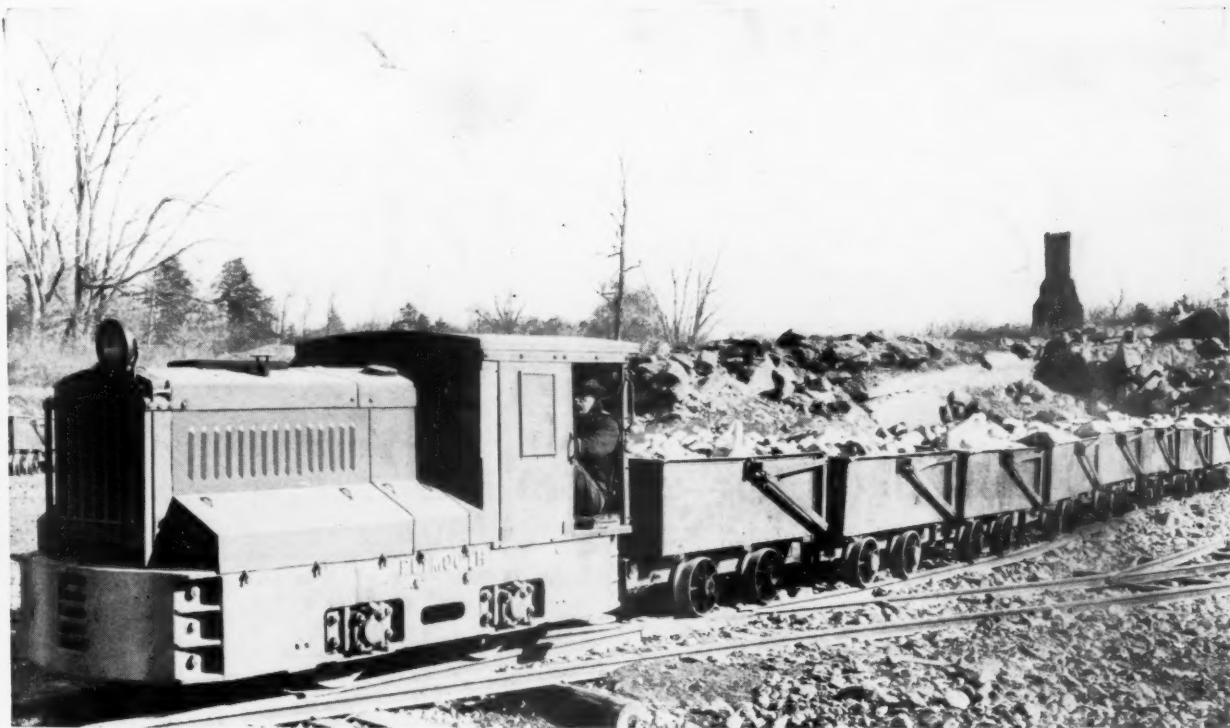
CEMENT *and* ENGINEERING
NEWS

Founded
1896

Chicago, March 7, 1925

(Issued Every Other Week)

Volume XXVIII, No. 5



Plymouth Saves 60 Per Cent

The Robert G. Lassiter Co., prominent Engineers and Contractors of Oxford, N. C., operate their own quarries. They write:

"We are using a Plymouth 7 ton Gasoline Locomotive, hauling a load of 22 tons up a seven per cent grade, or 55 tons per hour. Length of haul, 1 1/4 miles. Gasoline consumption, 13 gals. per 10 hours.

"We are saving 60% over our previous method of haulage, and the Plymouth has given very satisfactory service."

If your haulage is slow and expensive, write for Bulletins "C" and "F."

THE FATE-ROOT-HEATH COMPANY

Plymouth Locomotive Works

PLYMOUTH, OHIO

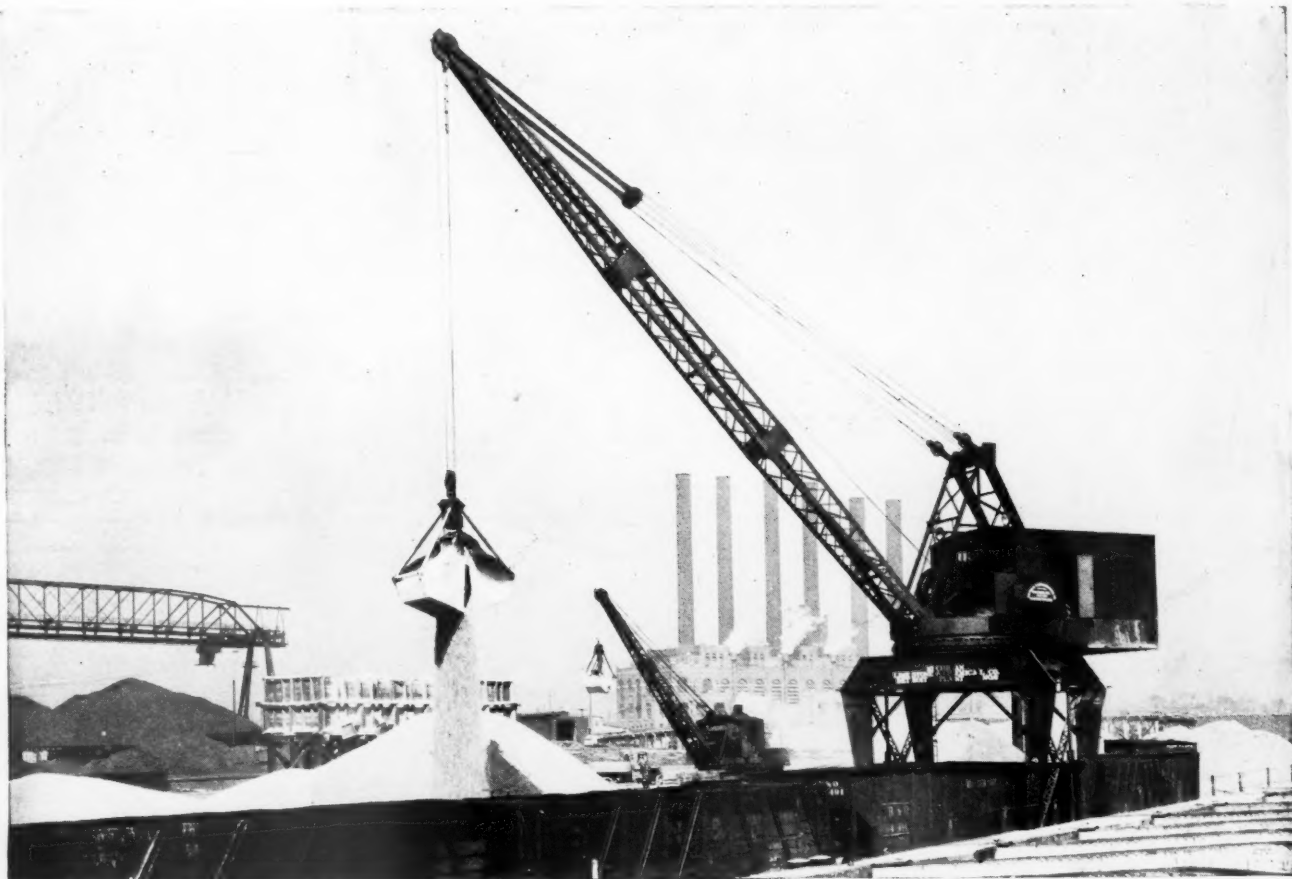
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O-S DEPENDABLE Cranes are rapidly winning favor among the large producers—a fact readily explained when a product consistently surpasses in performance the expectations of its purchaser.

STANDARDIZING on O-S equipment because of their generous reserve of merit is already a settled fact among many of the largest producers in the rock products industry — O-S equipment wins and holds the good will of all who buy it.

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Rock Products

CEMENT and ENGINEERING NEWS
Founded 1896

Volume XXVIII

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Number 5

"Permanent" Service Bins for Aggregates

A Recent Interesting Development
of the Mineral Aggregate Industries

HE PROFITS MOST who serves best" is getting to be a generally accepted business maxim. There is certainly no logical reason why it should not apply in the mineral aggregate industries as well as others; we find live-wire producers are already applying it. More and more they are beginning to look upon their organizations as public-service institutions as well as mere business organizations to produce and sell basic commodities.

Service bins at accessible distributing points to better serve contractors and other

consumers are in line with the public-service idea of modern business. Of course, such service bins are not a new idea. They have long been a part of the equipment of big city sand, gravel and crushed-stone producers. But service bins of a "permanent" type, of steel or concrete, are new and are in keeping with the rapidly developing sense of "permanency" in the industry as a whole.

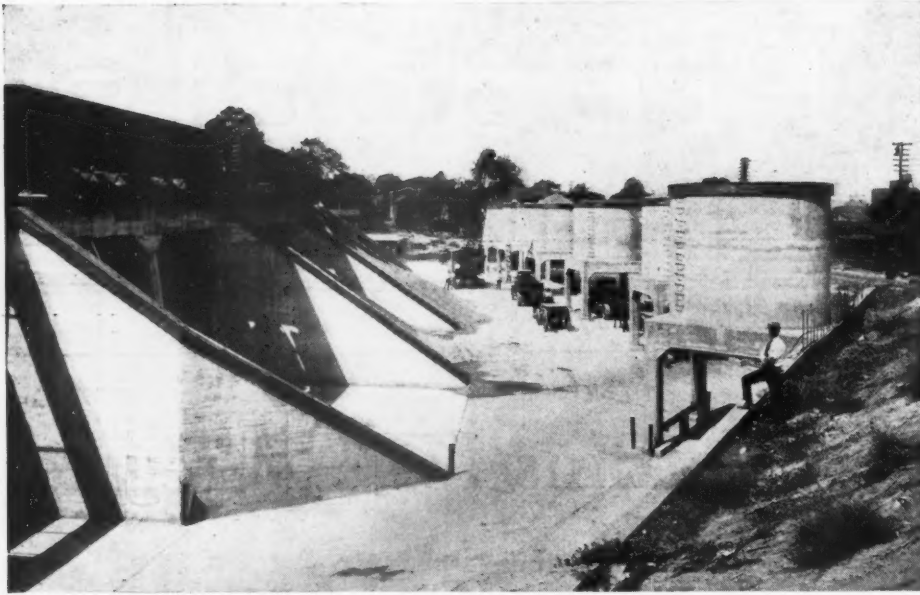
To the Connecticut Quarries Co., New Haven, Conn., probably belongs the credit for extending the service bin idea to various distributing points far removed from the

producing plant, and of designing a special type of service bin for receiving and handling mechanically rail shipments of crushed stone. Such service bins have already been established at Waterbury, Conn. (see *Rock Products*, April 7, 1923), Worcester, Mass., and Larchmont, N. Y. The type of bin used at the last named cities is illustrated herewith.

The bins at Larchmont, one of the Long Island Sound shore suburbs of New York City, are six in number and are located on property leased from the New York, New



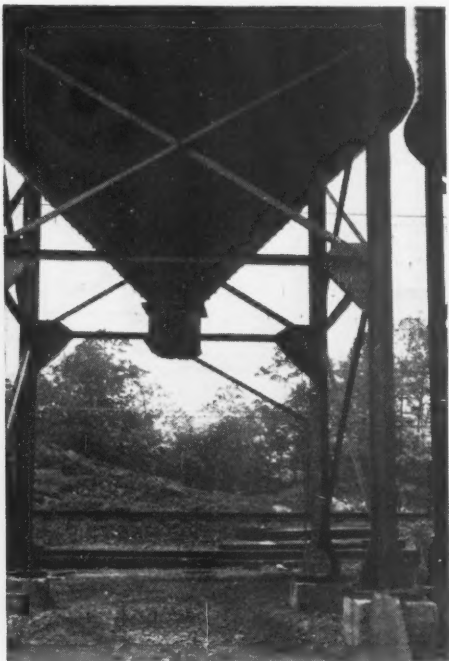
An example of modern equipment of a producer of crushed stone and sand and gravel for SERVICE—
The Fischer Lime and Cement Co., Memphis, Tenn.



Another view of the crushed stone, sand, and gravel bins of the Fischer Lime and Cement Co.

Haven & Hartford R. R., on the main line of which this station is located. The bins are steel cylinders with conical bottoms, approximately 15 ft. in diameter by 30 ft. high, on steel columns of sufficient height to give clearance over any loaded motor truck. The bins hold approximately 150 tons of crushed stone each.

A housed conveyor gallery extends over the tops of the bins. In this is a 45-ft. center shuttle conveyor, 16-in., driven by a 3-h.p. Fairbanks-Morse ball-bearing a.c. motor. The shuttle conveyor, of course, can be made to discharge into any one of the bins, or tanks. It is fed by an 18-in. steel chain bucket elevator from a track hopper in the service track to the bins. A 15 h.p. Fairbanks-Morse ball-bearing a.c. motor drives



Bin detail of Connecticut Quarries Co. Larchmont plant

the elevator. Of course, all shipments of stone to the bins are made in hopper-bottom railway cars. Each bin holds approximately two "battleship" carloads.

The conveyor and elevator were furnished by the Jeffrey Manufacturing Co., Columbus, Ohio, the bin gates and equipment by the Weller Manufacturing Co., Chicago, and the structural steel work was designed and fabricated by the Davis and Averill Co., Newark, N. J. Albert L. Worthen, vice-president and general manager of the Connecticut Quarries Co., is the real originator and designer of this type of crushed-stone service bin.

This service bin installation is equipped with a Fairbanks truck scale and a scale house and office. Four men are required to manage and operate the service bins. It is estimated that a service charge of 25 cents a ton more than covers the total cost of operation.

There are several other advantages to the quarry company aside from the obvious one



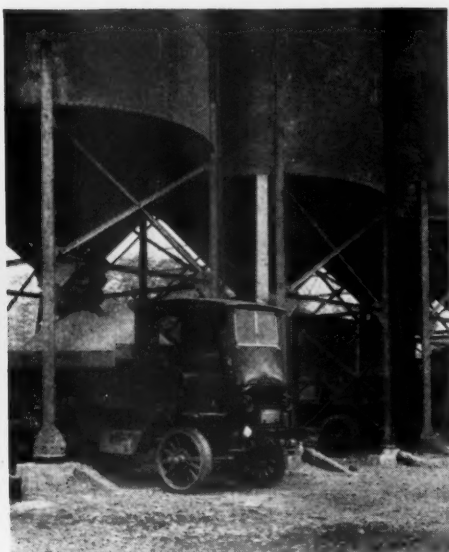
Crane is used transferring material from hopper-bottom car dumping bins to concrete tanks



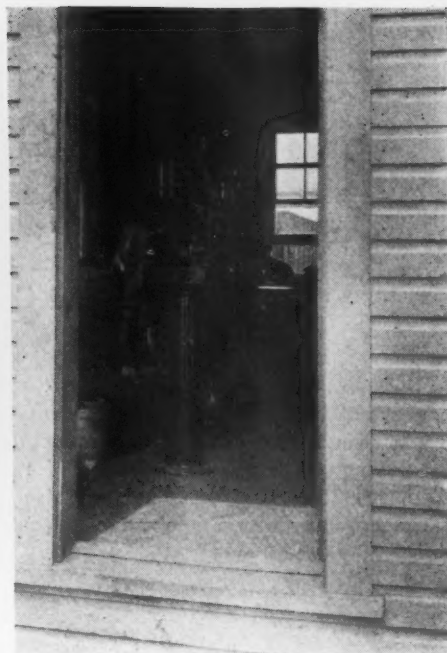
All-steel service bins of the Connecticut Quarries Co. at Larchmont, N. Y.



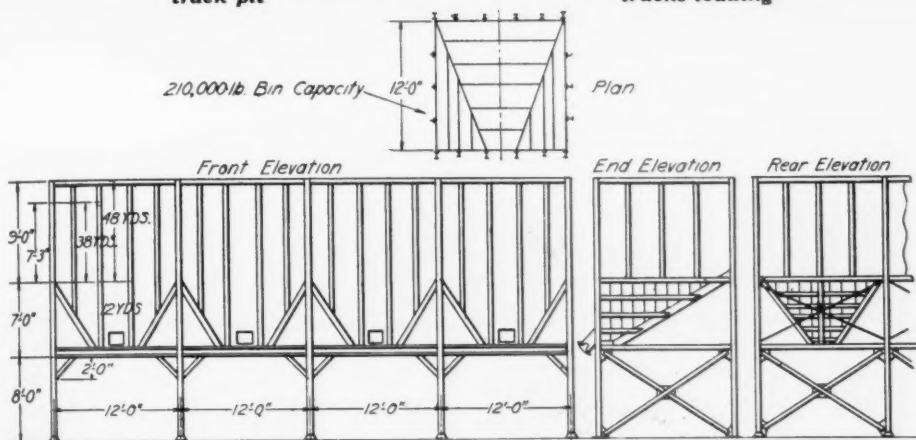
Hopper-bottom cars discharging to track pit



Close-up of bin with motor trucks loading



Interior of office and scale house



Details of all-steel service bins of the Atlas Sand and Gravel Co.

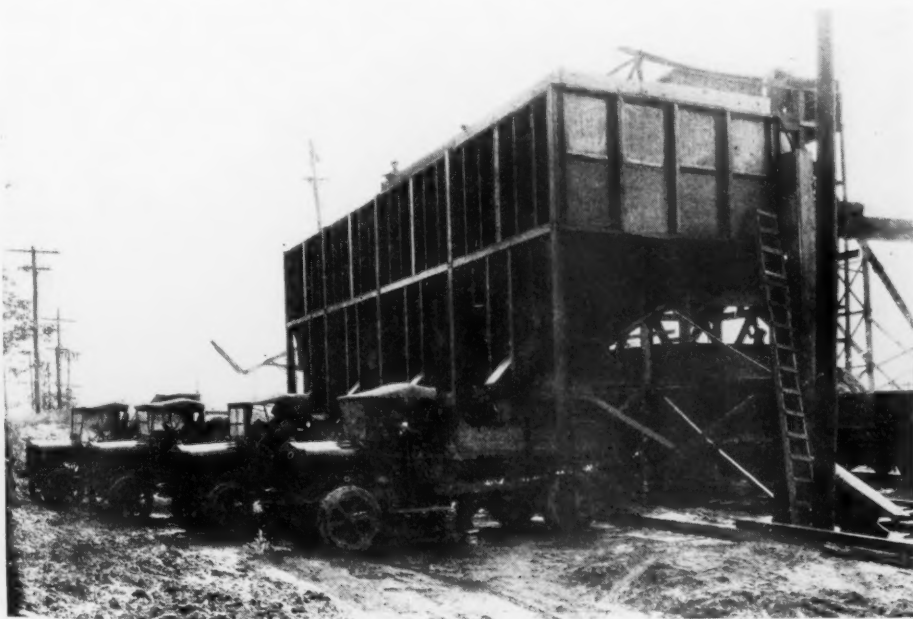
of being equipped to give prompt service at all times. There are the advantages of publicity from having a conspicuous and easily accessible sales depot, the advantage

of having a destination to absorb surplus production and thus keep the crushing plants and quarries on a more uniform and equitable producing basis, there is the advantage

of closer working arrangements with the railway company through providing the railway with shipments that can be made more or less at the convenience of the railway and thus provide earning power for otherwise idle equipment; and there is the intangible advantage of doing business in the most modern businesslike ways.

Other Examples

The other bins illustrated in these columns are those of big city sand and gravel producers who have waterfront properties and are shown as types of service bins that are being generally adopted in place of the old timber structures so common in the past.



Example of all-steel service bins built by a prominent Indianapolis producer—the Atlas Sand and Gravel Co.



Office and scale house of Connecticut Quarries Co. at Larchmont, N. Y.

Steelton Plant of the Bethlehem Mines Corporation

Two Quarries and Plants, One Producing High Calcium Limestone for Flux and Crushed Stone, the Other Dolomite for Furnace Lining

THE Bethlehem Mines Corporation has several limestone quarries in Pennsylvania, primarily engaged in the production of fluxing stone for the furnaces of the Bethlehem Steel Corporation. It is also a large producer of crushed stone in com-

mercial sizes, and one of its plants, at which both flux and commercial crushed stone are produced, is at Steelton, a suburb of Harrisburg, Penn.

There are really two plants and two quarries at Steelton. The main quarry is worked for high calcium limestone, the other for dolomite. This dolomite is utilized for burning to "dead burned" dolomite used in the open-hearth furnaces in the

steel plant which is near by. The limestone is made into flux stone and stone for concrete aggregate and like purposes.

Quarry practice in the main limestone quarry is to put down well drill holes 5 ft. deeper than the face, which is from 92 to

105 ft. high, spaced according to the ground to be broken. The broken rock is loaded by two Bucyrus steam shovels, one of 65 and one of 70 tons. These shovels are rigged with special dippers of the company's own design and construction, which hold 2½-yd.. A model 37 Marion shovel will be put into service about March 1.

Since this company has at its disposal such large and well-equipped manufacturing facilities, and since it has such a wealth of experience gained in the operation of its many mines and quarries to draw upon, it is natural that it should build a great deal of its equipment from its own designs. The quarry cars are an example. They are end dump cars holding 3 yd., very heavily constructed and reinforced. They have higher sides than is usual, which, of course, is no disadvantage to the steam shovel, but would make them inconvenient for hand loading.

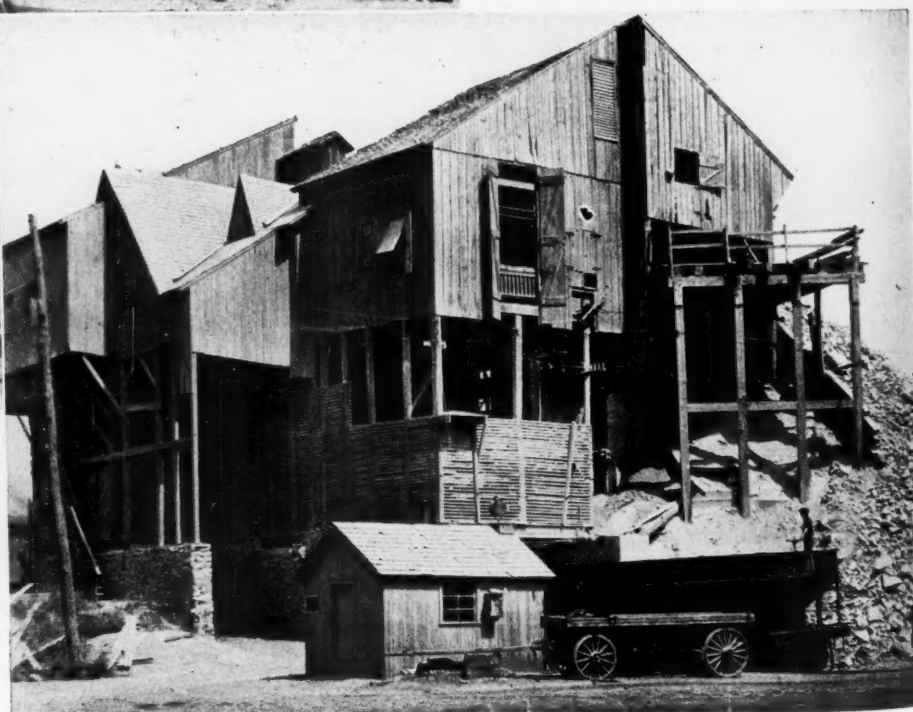
Loaded cars are drawn by a 3-ton Plymouth gasoline locomotive to the bottom of an incline that leads to the main crusher. This is a single roll crusher made by the McLanahan Stone Machine Co., the largest size they



Back of limestone plant and incline from the quarry

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Front of limestone crushing plant showing bins for truck delivery

make with a 36-in. roll. The hopper to this roll serves as a receiving hopper for the plant, the cars being dumped directly into it. This hopper is about 10 ft. square at the top.

The roll of the single roll crusher is provided with knobs or sluggers, and these

Although this machine is set at the very top of the plant, there is surprisingly little vibration to be felt while it is running.

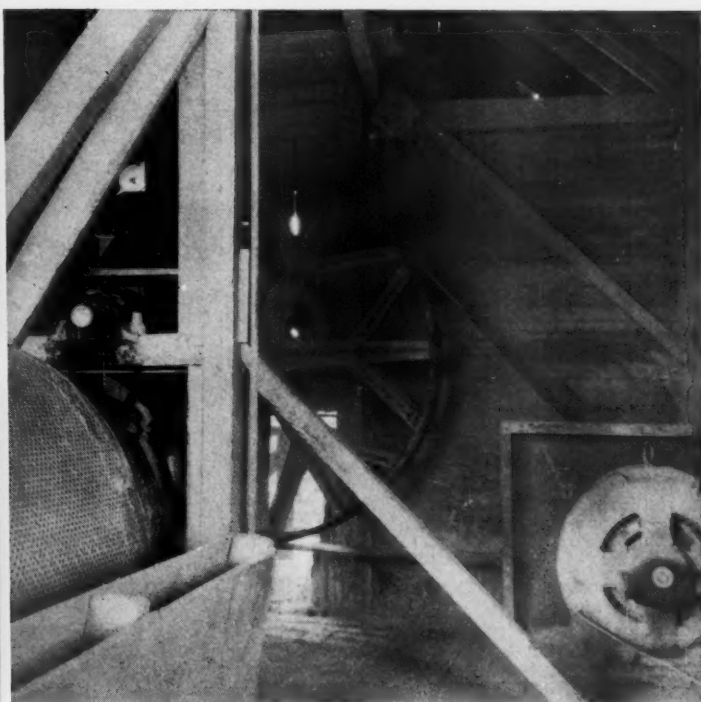
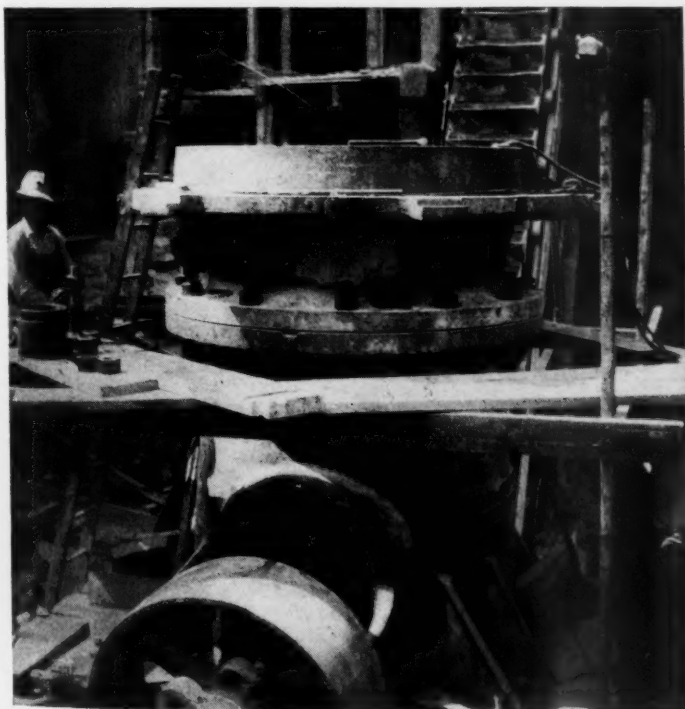
The single roll crusher breaks to 8-in. cubes and finer. After passing this crusher all stone goes over a grizzly to remove fines. The oversize passes to the flux bins when the

by the gate operator, who is able to observe the progress of loaded cars from quarry to crusher.

The fines through the grizzly are carried on a belt conveyor to a 10x21-in. bucket elevator and discharged into the main screen 5-ft. diameter, 24-ft. long. Material passing



Left—Locomotive with quarry car built by the company. Right—Hand work at the dolomite quarry



Left—Installing a No. 8 crusher at the limestone plant. Right—Detail of screen drive in the dolomite plant

crush and bite the limestone and break it in pieces against a vertical jaw plate. The capacity is large, a car of rock passing through about as fast as it can be poured from the car.

stone is suitable for flux. However, when the stone is not of flux quality, the oversize is diverted by means of a gate to a conveyor, which feeds a No. 8 Allis-Chalmers gyratory crusher. This division is determined

through the No. 8 crusher is discharged into 12x12x30-in. elevator and elevated to a 48-in. by 16-ft. revolving screen, which separates the stone into screenings 0 to $\frac{5}{8}$ -in., highway stone $\frac{5}{8}$ -in. to $2\frac{3}{4}$ -in. and oversize

or into various sizes below 2¾-in. as desired. This plant, however, is primarily for highway specification stone.

The oversize from both screens is returned to a No. 6 Traylor gyratory, which discharges to an 18-in. conveyor, which in turn discharges to the belt elevator mentioned above, and so into the 5x24-ft. screen. The

New Rock Quarry to Be Opened in Missouri

A NEW quarry will be opened by a company headed by W. T. McKee of Windsor, Mo., a mile south of Excelsior Springs, Mo. Engineers for the Wabash railroad have made a survey for the construction of

building from Moberly to Kansas City, Mo.

John T. Dyer Co. Abandons Quarry Project

THE project of opening immense trap rock quarries along the north near Birdsboro, Penn., has for the time being been abandoned by the John T. Dyer Quarry Co., of Norristown, Penn. The Dyer company have entered into a new agreement with the lessees of their present trap rock plant, the Birdsboro Stone Co. of Philadelphia, Penn., the duration of which has not been made public. They will continue operations at their old plant.

It is expected that the Dyer company will soon begin the work of returning their equipment from the proposed Monocacy Hill plant, the machinery for which already had been shipped there and used in the siding, which was being constructed from the main line of the Reading railway to their proposed new quarry.

For the present, at least, no more work will be done on the two-mile siding to their new quarry. The John T. Dyer Quarry Co. owns practically the entire Monocacy Hill. The Dyer company is now operating its No. 4 quarry and crushing plant.

Both the Birdsboro Stone Co., and the John T. Dyer Quarry Co. are looking forward to big business during the coming season.—Reading (Penn.) Tribune.

The secretary and general manager of the John T. Dyer Quarry Co. is F. T. Gucker, who is prominent in the activities of the National Crushed Stone Association.



Crushing plant at the dolomite quarry

screen layout makes possible the manufacture of highway specification stone and ordinary commercial sizes at the same time, giving a desirable diversity of product.

Sizes Made

The sizes usually made at this plant are: "Screenings," from 0 to ¼-in.; "Number Two," which is from ¼-in. to ¾-in.; "Number Three," which is from ¾-in. to 2-in., and railroad ballast, between 1-in. and 2½-in. Flux stone or furnace stone runs from 4-in. to 8-in.

At the other plant the rock is loaded into quarry cars by hand and hauled up an incline and dumped directly into a Champion steel-frame crusher. The crusher product is then elevated to a 24 ft. screen, 36 in. in diameter, which has 1½-in., 1-in., ¾-in. and (in the dust jacket) ¼-in. perforations. The way in which the 25 hp. Westinghouse mill type motor is connected to this screen is a good example of how the necessary reduction of speed can be secured in a confined space.

This is an exceedingly well built little plant and might serve as a model for small local operations where the market will take only a few hundred tons daily.

M. L. Jacobs is general manager of quarries for the Bethlehem Mines Corporation. F. H. Vanatta is superintendent of the Steelton quarry and crushing plant described above.



Steam shovel working in limestone quarry. Note the lines on the rock that show the inclination of the strata

Rock-Dusting Coal Mines as an Explosion Preventive

Unqualifiedly Endorsed by Coal-Mine Experts in Addresses Before the American Institute of Mining and Metallurgical Engineers

THE rock-dusting of coal mines as a preventive of explosions was one of the principal subjects discussed at the recent annual meeting of the American Institute of Mining and Metallurgical Engineers in New York City. There was much in these discussions of general interest to producers of rock dust for this purpose, and probably much of practical value to them in promoting sales efforts, although there was a tendency on the part of some speakers to encourage the production of shale dust by the coal mining companies.

No experienced limestone producer need have any fear of the ultimate result of attempts on the part of coal operators to produce rock dust for themselves, for every limestone producer who has made rock dust of a fineness such that 50% will pass a 200-mesh knows that it requires an extensive plant and the consumption of much power; and that pulverizing to this degree of fineness can be done economically only on a large scale. Farmers in nearly every locality have tried at one time or another to produce a much coarser material for agricultural limestone in competition with commercial crushing and grinding plants, and experience has shown over and over again that it "can't be done." So, while some of the coal companies may have to learn this by experience, they are bound to learn it sooner or later.

Review of Coal-Dust Investigations

George S. Rice, chief coal mining engineer of the U. S. Bureau of Mines, Washington, D. C., gave a very comprehensive historical review of coal-dust investigations from earliest days to date, from which we have made the following extracts:

"The publications prepared by the writer and associates from 1911 on, increasingly emphasized rock dust as one method of coal-dust explosion prevention and pointed out that if watering was done the dust must be so wet that it was mud, or it would not be effective.

"Many Bureau reports on individual mine disasters recommended rock dusting. These reports are made only confidentially to the mine operator concerned, because it is the function of the respective State department to investigate officially and legally require such improvements or changes as decided upon.

"In 1916, after a year's trial, with favor-

able results, of a stretch of rock dusting in a commercial mine in the Pittsburgh district, the Bureau engineers thought that the time had come for further developments and issued a circular letter to manufacturers of crushing machinery (which was also published in *Coal Age*, April 15, 1916) stating, As a result of mine-explosion experiments at the Experimental Mine and explosion-prevention investigations in the field, the Bureau strongly recommends the use of finely crushed or pulverized rock dust having no combustible matter, or a very small percent-

Editor's Note

ROCK DUST is employed in two ways to prevent coal-mine explosions. It is scattered or distributed in the mine passages to help hold down the explosible coal dust and to form an inexplorable mixture with the coal dust when they are stirred up together. Rock dust is also used for "barriers" in the mine passages. These barriers are boxes or shelves of dry dust designed to be upset at the time of the explosion and in spilling the dust form curtains which stop the progress of the explosion.—The Editor.

age, as a preventive for coal-mine explosions. The circular suggested that this was a new field for crushing or pulverizing machinery; also that there was need of a mechanical rock-dust distributor.

"This proposal had no apparent results. In view of the present enthusiasm of many for rock dusting, it is difficult to account for mine operators not taking it up earlier. Perhaps it may be explained on the ground that the Bureau of Mines in its formal publications had not declared, until later, a strong preference, but had described wetting methods as well as rock dusting for explosion prevention. Another reason may be that prior to and during the world war, the operators were too busy to think of new methods and for four years following the war to 1922 the United States experienced no major coal dust explosions.

"In 1918, the Old Ben Coal Corporation

of southern Illinois, of which J. E. Jones is the Safety Engineer, had a bad explosion that killed all men in the mine (fortunately there were but 17 men in the mine at the time). The company sent samples of its coal to the Experimental Mine for testing. Rock dust and rock-dust barriers were successfully demonstrated. The company decided to use barriers and Mr. Jones designed and installed some on the same principle but slightly differing from two of those described in the author's paper of 1914. The company has since had seven explosions, all of which were stopped by barriers, saving hundreds of lives.

"However, as some men were killed in these explosions inby or between barriers, the company decided, about a year ago, to use generalized rock or shale dusting. The shale was obtained from the roof and Mr. Jones has developed a rock-dusting machine, the fan motor being driven from the trolley wire.

"In 1922 and 1923, there were sixteen explosion disasters, in which coal dust was considered to be the cause of propagation, causing 530 fatalities. This aroused anxiety, especially as at several of these mines efforts were made by the respective operators to sprinkle thoroughly.

"Director Bain decided, in the spring of 1923, that the time had come for the Bureau of Mines to take a decided stand, that watering even with the best of intentions had not proved efficient as practiced. Whereas, on the basis of the Bureau's tests and recommendations of its investigators in the coal-dust question, generalized rock dusting had been demonstrated to be a positive means of preventing explosions.

"The writer was detailed to visit European mines on certain matters and, in particular, to study the methods of rock dusting being practiced in Great Britain and France. Typical mines in different districts were visited and he was greatly impressed with what was being done at most of the mines, in the thorough way rock dusting had been done.

"Last spring, the Bureau issued tentative specifications on rock dusting (Serial 2606, by Rice, Paul, and Sayers). Meantime, the Pittsburgh laboratory of the Bureau has made hundreds of microscopic and chemical analyses to determine the suitability of the rock dust on the basis of the tentative specifications and the Chief Surgeon, Dr. R. R.

Sayers, has been conducting physiological tests to determine advisable limits of free silica and the effect of different dust mixtures. Recently, a committee of the Institute, Howard N. Eavenson, chairman, in co-operation with the Mining Standardization Correlating Committee, has undertaken to draw up standard specifications.

* * * * *

Amount of Rock Dusting Required per Unit of Entry

"This question depends on: (a) The amount of coal dust and natural inert matter present in an entry before rock dusting; (b) the explosibility hazard presented by the particular coal dust, which differs in volatile combustible and ash content and moisture present; (c) size of particles as represented by the proportion of 200-mesh dust of the total dust (through 20-mesh); (d) whether the air current is intake, or if a 'return,' the percentage of firedamp normally present.

"The Bureau's experiments have shown that it requires from 3 to 5% more non-combustible in the dust to offset each 1% of firedamp in a return. . . . In order to give some idea of the quantity needed to those who have not used the method, the first application in an entry of ordinary size that has been thoroughly cleaned in advance should be not less than 2 or 3 lb. of rock dust, and preferably 4 lb., per linear foot. This if properly applied, by hand or by one of the dusting machines on the market, should fill with rock dust the crevices and recesses along the ribs and cover the top surfaces of timbers and projections.

Kind of Rock-Dust Material

"The Bureau investigations have shown that any dry, inert dust or dust with little combustible matter (under 9%) that does not cake in a humid atmosphere, is efficient as a coal-dust explosion prevention material, when used in sufficient proportion to obtain in the mixture with the coal dust from 50 to 75% non-combustible. The percentage depends, as before stated, on the character of the coal dust and its fineness. Obviously, the nearer the white road dust is the better will be its illuminating effect in an entry. Hence the Bureau has particularly recommended pure limestone, dolomite, and gypsum apart from the general freedom of these materials from silica.

Effect of Rock Dust on Health

"As many materials proposed for rock dusting, including shales, contain much free silica, it has been considered advisable by the physiologists of the Bureau to recommend tentatively that dust containing over 25% free silica be not used, where it is liable to get into the air and be breathed. This specification would manifestly have no application to dust used in barriers or in disused workings or rarely traveled entries.

* * * * *

Size of Rock-Dust Particles

"The experiments of the Bureau have in-

dicated that rock dust with as much as 50% through 200-mesh is as effective as if the dust is all fine particles. Not until the percentage was as low as 30% was a difference apparent. The proper size of dust and questions of distribution by mechanical means and the cost of fine grinding is being much discussed by mining men. Some have contended that an extremely fine dust must be used, but, so far as explosion prevention is concerned, the need of extreme fineness has not been demonstrated by explosion experiments or by explosion experience in dusted commercial mines. Hence, the tentative specification of the Bureau for 50% through 200-mesh, which agrees with the British experience, appears reasonably safe for the present.

Rock-Dust Barriers

"As repeatedly stated, the writer and his associates agree that rock-dust barriers should be regarded as secondary defenses and are especially useful at strategic points—entrances to panels, connections with adjacent mines, and at the entrance to unsealed old workings. The writer also recommends they be used at intervals of from 1000 to 2000 ft. along haulage roads in addition to generalized rock dusting.

* * * * *

"Any one set of box or trough barriers or the concentrated barrier relied on in a mine with no generalized rock dusting should contain about 100 lb. of rock dust per square foot of cross-section of entry.

* * * * *

Progress in Rock Dusting

Edward Steidle, of the Carnegie Institute of Technology, presented a comprehensive paper on "When, Where and How to Rock Dust Coal Mines." He said, in introducing his subject:

"Those who have followed the rapid progress in the art of rock-dusting bituminous coal mines must admit that opinion crystallized during the year just closed in support of this remedy for coal-dust explosions. The fatalities from explosions and fires in 1924 jumped from a normal of 12.21% to about 25% of all fatalities in bituminous coal mines. Up to 1924 only one mining company in America practiced rock-dusting on a large scale, but during 1924 forty-two companies had adopted this safety measure, and the 'boom' is expected to extend over the next 2 or 3 years. Alabama is represented by 1 company, Colorado 3, Illinois 4, Kentucky 1, New Mexico 4, Pennsylvania 20, Utah 8 and Wyoming 1. A total of about 500 miles of entry has been dusted. Illinois leads with 275 miles of dusted entries and Pennsylvania holds second place with about 175 miles. In each case there is a sense of great security, not only on the part of the operator, but by the miner as well.

"It is also interesting to note that during 1924 the compensation rating or inspection bureaus in 12 of our coal-producing states revised their rating schedules so that a credit

would be given for rock-dusting. This credit ranges from 10 to 20 cents per \$100 payroll.

"Recent drastic Federal and State regulations approved by mine operators made rock-dusting compulsory in bituminous coal mines in Utah, beginning July 1, 1924. Legislative action favorable to rock-dusting may be expected in other states. Colorado has already proposed a change in its laws, and Pennsylvania, Maryland, Washington and West Virginia are now giving the matter due consideration. If the rock-dusting problem is handled properly and proves to be entirely successful, no mining man of any standing will delay applying it in his mine. State legislation regarding this matter may or may not solve the problem. At present the mining companies who are rock-dusting of their own choice are doing it carefully and thoroughly. In Utah some are doing it conscientiously, with intent to get what good can be obtained, while others are reported to be doing it only to keep within state regulations. In any event, if we are to have new legislation, it is essential that the various states know what they are about and then, if possible, work for uniform regulations.

* * * * *

Efficacy of Rock-Dusting

"When not less than a 50:50 mixture of rock dust and coal dust is thrown into suspension, the rock dust, together with the coal dust, absorbs heat and lowers the temperature of the flame of propagation below the ignition temperature of the coal dust. Further, the particles of rock dust get between the particles of coal dust and have a curtain-like effect. One of the most reasonable merits of rock-dusting is the fact that once the dust is distributed systematically throughout the mine it remains there indefinitely and is always "on guard" during the dangerous period of the year (winter).

"Beginning with 1910 and ending with 1924, there have been 58 explosions in which coal dust is known to have played an important part. There was a total loss of 2,422 lives, to say nothing of millions of dollars in property. It is estimated that 75% of the lives lost in these explosions would have been saved if the mines in which the explosions occurred had been systematically rock-dusted.

* * * * *

Raw Materials for Rock Dust and Cost Thereof

"Limestone is now used by 17 companies, principally because coal men know little about pulverizing and all desired to make an early start in rock-dusting their mines. The dust used thus far ranges in fineness from 50 to 92%, with an average of 74% through 200-mesh. It is fairly generally agreed at present that the most convenient dust to handle is about 60% through 200-mesh. Limestone dust can be purchased from numerous limestone companies, and is usually shipped in 80-lb. sacks, similar to flour and cement, which arrangement facili-

tates and prevents loss in handling. Sacked limestone dust, 50 to 60% through 200-mesh, can be purchased at Youngstown, Ohio, for \$4.50 per ton, plus freight charges to the Pittsburgh district at \$1.45 per ton, or a total of \$4.94 per ton. Limestone dust, 75% of which will pass 200-mesh and prepared for shipment in the same manner, can be purchased in Bellefonte, Pa., for \$5 per ton. Transportation charges to the Pittsburgh district are \$1.50 per ton, or a total of \$6.50 per ton. Erie, Pa., sacked limestone dust, 60% of which passes 200-mesh, can be delivered in the Pittsburgh district for \$5.95 per ton, and dust, 80% of which will pass 200-mesh, at \$6.45 per ton.

"A number of the shale formations associated with the coal measures will contain less than the allowable amount of silica, combustible matter, and moisture, and will be suitable for rock-dusting. Some shales contain as low as 8% of free silica, while others run as high as 50%. The average, however, for a large number of samples taken in various localities in the United States is about 20 to 25%. Twelve companies are already using shale and find it more economical to crush and pulverize the rock at the mine. Transportation charge, at least, is saved. It is doubtful whether pulverizing can be done efficiently underground, because of the moisture which prevails during the major part of the year. At one operation where the pulverized dust is prepared on the ground, it is claimed that it costs \$1.75 per ton to deliver the rock to the crushing and pulverizing unit on the surface, and \$1.25 for crushing and pulverizing, or a total of \$3 per ton for the finished product. It might be added that the wage scale at this mine is on a basis of \$7.50 for day labor. At another operation it costs \$1.91 per ton for crushing pulverizing, which figure includes all legitimate charges.

Physiological Effect of Silica in Rock Dust

"Physiological tests have shown that pure limestone dust is not injurious to health. Rock dust that does not contain more than 25% of free silica is not likely to be harmful. However, investigators are still in doubt as to whether the effect is really mechanical or toxic. Mining men have been too serious relative to the physiological effect of rock dust. There is really little rock dust suspended in the air except during the actual operation of coating the passageways or preparing concentrated areas or leading barriers, and if warranted a standard respirator may be worn by the workman. As a matter of fact, it is possible that trip-riders are most concerned and they should suffer no unusual inconvenience or ill-effect. The only other time when dust is really suspended in the air in appreciable quantity is when it is actually fulfilling the purpose for which it was intended. Rock dust containing as much as 35% of free silica has been used in some mines in Great Britain for a period of

12 years and no ill-effect has been reported.

General Rock-Dusting

"About 85% of coal-dust explosions in America have initiated on narrow work, either along the haulageways or at the faces of development workings. Rock-dusting should, therefore, be done first on all haulageways and other narrow work in use up to and including room-necks, and up to within 40 ft. of the face or to the last break-through of all development workings. Dusting should start at the face and proceed toward the shaft or other openings, and preference should be given to the more gaseous sections. Some mining men believe that it will not be necessary to rock-dust unused back entries. No fine coal dust is "manufactured" in these entries, and furthermore no explosion will occur without a source of ignition, but some fine coal dust as well as rock dust is carried into these entries by the return air current. Others feel that rooms need not be dusted; but the coal-dust hazard exists in rooms, a source of ignition is possible and rock-dusting may eventually extend into these workings.

"Rock-dusting consists of spreading a thin layer of dry rock dust on the surfaces of rigs, roof and timber. For initial dusting, depending upon conditions, 2 to 6 lb. is used per linear foot. It may or may not be necessary, depending on sizing and analysis records, to apply much rock dust directly on the floor. As already indicated, the roadways depending on roof conditions and grades may contain a relatively high percentage of incombustible material, and some dust always bounds off the ribs during dusting and settles on the floor. In other cases the road dust may contain proportionately a greater percentage of combustible. It might well be added here that fine coal dust settling on the rock-dust coating will stick to the rock dust, and will not run off and fall to the floor as was originally expected. Another theory that is pretty well 'blasted' is that the ventilating current can be depended upon to distribute rock dust effectively to any great extent. It takes weeks under normal conditions for any appreciable quantity of coal dust to settle on rib, roof and timber. If rock dust is blown into a ventilating current, the major part of the dust is deposited in the passageway, particularly on the floor in the first 200 ft. It is only the very fine, microscopic dust which is carried along in the air current and finally deposits on the floor, rib, roof and timber. Some of the finest dust may be carried out of the mine by the ventilating current.

Cost of Rock-Dusting

"Minimum cost can only be realized by systematic dusting with an efficient distributor after a due amount of experience. Little reliable cost data are available, and the range of variation is so great that even wide generalizations are likely to be unsatisfac-

tory. The most desirable figures will be unit costs per ton of coal mined and on a long-term basis. The mines in which rock-dusting is being done have worked rather irregularly during the past year, consequently the best cost figures available are on a basis of linear feet of entry. These figures actually average about 1 cent per linear foot of entry, and two companies assert that the cost in their mines on a tonnage basis is about one-quarter cent per ton of coal mined. It must be remembered that as in the case of all other reliable cost data, the cost of rock-dusting must account for many items of expense and not merely the cost of labor and dust. It is true that the cost of cleaning up haulageways prior to rock-dusting ranges from 5 to 8 cents per linear foot, but this item can not be considered a legitimate rock-dusting expense.

"In the mines of one company two men are now rock-dusting over 6,000 ft. of entry in an 8-hour shift or in 4 hours of actual dusting, and it is reasonable to expect that eventually it will be possible to dust effectively 2 miles of entry in 8 hours. Furthermore the cost on a long-term basis should not exceed one-half cent per ton of coal mined.

Rock-Dust Barriers

"Rock-dust barriers or heavy concentration of rock dust called 'Zones,' at desirable points may be used to advantage but they are usually considered as secondary defenses. The so-called 'box' and 'concentrated' types may be employed to isolate old abandoned workings, panels, live sections of a mine, splits, and at other key positions, as well as in the passageway between two connecting mines. They may hold from 1 to 3 tons of dust; in other words, should contain 100 lbs. of dust per square foot of cross-sectional area at the point of installation. They are installed against the roof or in an excavation made in the roof, and should extend across the entry. The cost of box barriers installed is estimated at about \$75 each; concentrated barriers will cost installed about \$150 each. The V or 'trough' type contains from 100 to 200 lb. of dust, and may be installed in batteries of 15 or more in strategic positions or restricted points such as sharp bends in entries, on the inby and outby sides of overcasts, etc. They may or may not extend across the entry, depending upon their use and position. Trough barriers installed will cost about \$2.50 each or about \$37.50 for a battery of 15 troughs. All barriers should be constructed so that they will be operated by the advanced wave of an explosion in either direction, and will remain in operation during a period of at least seven seconds. The dust falling as a curtain is whirled into suspension and dampens or blankets the flame. The cost of barriers can not be prohibitive, at the same time they should fulfill the specifications proposed by the Bureau of Mines. A great assortment of barriers is now in use, principally in the Rocky Mountain States.

One type of V or trough barrier made of lead-covered, sheet steel to prevent corrosion, is now on the market.

Rock-Dusting Increases Illumination Underground

"About 90% of the light underground is absorbed by the coal. The rock dust, and particularly that prepared from limestone, greatly increases the illumination, and consequently increases the efficiency of the workman and decreases accidents. One company is installing a crushing and pulverizing unit and will prepare dust from shale made in the mining operation for dusting back entries and for barriers if such are ever employed. However, this same company will purchase crushed limestone, pulverize it at the mine, and use it on all main haulage-ways, claiming that the motormen are enthusiastic over the results of the increased illumination. It is also possible that limestone dust will protect steel timber, prevent spalling of roof and coal, and in a measure neutralize acid mine water.

Rock Dust as Fire-Fighting Material

"Rock dust may be an efficient fire-fighting material and is, no doubt, much safer to use than either water or chemicals. It is reported that a terrific fire in dry coal in one of the mines of the Old Ben Coal Corporation was successfully extinguished with the use of rock dust. The attack really started about 100 feet from the fire on the intake, and consisted of throwing dust from the troughs toward the fire. As reported, the great cloud of rock dust seemed to cool the area so that advance could be made and additional dust introduced. Propping, of course, was done as the advance was made. The dust sealed the fire, except in large crevices and in spots along the ribs. A second crew filled these crevices with shale dust and spread more dust along the rib where warranted. In a short time the fire area, which was about 100 feet long and 12 feet wide, was completely covered with several inches of dust. The remains of the fire and the coal, which was hot or warm, was then loaded out in the usual manner.

Several mines in Illinois keep on hand at desirable points sacked rock dust for fire-fighting purposes.

Rock Dust as Stemming Material

"Rock dust may also have special merit as stemming material for shot-holes, as compared with clay or other inert substances. It is claimed that the percentage of lump coal can be increased, with a reduction in consumption of explosives, but no actual quantitative tests have been made so far. 'Cushioned' blasting has been practiced by a few expert shotfirers, and its advantages have been recognized in connection with the use of permissible explosives. Stemming consisting of loose rock dust will produce a cushioned effect. The procedure in brief consists in placing one or more cartridges

More Human Fuel

(AN EDITORIAL IN THE CINCINNATI, OHIO, "POST")

LIVES of 51 more coal miners lost in an explosion in a coal mine at Sullivan, Ind. That means 51 fathers, or sons, or brothers gone from almost as many families, more human fuel for somebody's furnace.

Last time it was the little town of Castle Gate, Utah, where the streets were lined with mothers and children, wondering who would pay the rent and provide the food and clothing, with husbands and fathers lifeless in the deep, black coal tunnels.

As the U. S. Bureau of Mines says:

"Investigations carried on by this bureau for more than 10 years have demonstrated beyond question of doubt that spreading of coal mine explosions can be prevented. Responsibility rests with the mine managements."

It costs a little money to SPRINKLE COAL MINES WITH ROCK DUST, and that little money might come from profits. Hence we have a price list, the cost of our fuel, such as this:

"Crosby, Minn., 42 lives.

"Shanktown, Penn., 37 lives.

"Johnson City, Ill., 34 lives.

"Dawson, N. M., 125 lives.

"Kammerer, Wyo., 100 lives."

And so on! It is the cost of coal. Necessary?

Not at all, according to the U. S. Bureau of Mines.

Not long ago the "Post" said, in an editorial:

"The average citizen slowly is awakening to the fact that the public has an interest in coal mining. This interest is chiefly in prices charged for coal. But hasn't the public also a responsibility?

"Or can the public say, 'I am not my brother's keeper. I owe nothing to the men who go down into the earth to dig the fuel that keeps me warm. Blood-stained coal lights the hearth with as warm a glow as any other kind.'"

Coal profits call for human fuel. From where, next time?

of rock dust in the hole on top of the explosive charge. The explosive cartridges, or the cartridges of rock dust, are not slit. About 1 ft. of solid tamping is usually placed at the end of the dust charge or the collar of the hole. The explosion is supposed to compress the rock dust and wedge it tightly

in the mouth of the hole, so that none of the gases can escape until they do their work in bringing down the coal. If this is true, there is no energy left to distribute the dust into the room. Some mining men believe that the force of the explosion really compresses the first rock dust cartridge, completely blocking the hole at this point, and does not affect the remaining cartridges. In either case it is a question as to how well the gaseous products of combustion of a properly made shot aerate and distribute the rock dust. In the case of a blown-out shot, however, the rock-dust stemming may help to quench the flame. It is also doubted whether sufficient dust will be employed as stemming material to rock-dust a room effectively as advance is made, but at one mine where experiments were made with rock-dust stemming, it was found that the dust was distributed in the room as many as 50 ft. back from the face. At this same mine a band of bone occurs in the middle of the bed, and it is important that this bone is not pulverized by the explosive charge. The officials of this mine believe that more lump coal and cleaner coal is produced with 20 to 30% less explosive. It is possible that this increase in lump coal and reduction in amount of explosive is due more largely to part 'air-spacing,' closer supervision, and more accurately placed and drilled holes. In any event, if rock-dust stemming will make it more easy to secure a better 'spreading' effect with permissible explosives than is usually obtained, the matter should certainly be given careful consideration."

* * * * *

Conclusions

"Rock-dusting is the most reliable, as well as the cheapest method known at the present time to prevent and limit coal-dust explosions. However, it can not be handled in a haphazard manner, and, like all safety measures, must be done thoroughly to be effective. Likewise, as in the case of other safety measures, it must be considered as simply an extra precaution. Furthermore, it is well to emphasize the fact that rock dust alone will not make our bituminous mines entirely safe. As pointed out, fine, dry coal dust can be 'killed' as it is made, and its accumulation in dangerous quantities can be prevented. It is also imperative that we take advantage of 'approved' equipment and appliances and permissible explosives. Last, but not least, we must properly and conscientiously inspect and ventilate our mines, and thereby prevent an accumulation of gas which is the common source of ignition for coal-dust explosions. In conclusion, it may be stated that while there is much to be learned regarding both methods and costs, still there is no apparent reason whatsoever for delaying the application of rock-dusting in our bituminous coal mines and thus make them safe."

Diesel Engines for Rock Products Plants

Improvements in the Design and Construction Have
Rendered Them a Fully Dependable Source of Power

By R. H. Bacon

Oil Engine Division, Fairbanks, Morse & Co.

THERE are two important factors in the choice of a power supply for work in the rock products industry which must be given careful consideration if the installation is to give satisfactory service. The first of these is dependability and the second is the over-all power cost. The Diesel oil engine has shown that it will handle all classes of power applications at a very low cost as compared with either steam equipment or purchased power. The advocates of these two other methods of handling the power problem sometimes attempt to make a case around the dependability factor, stating that the Diesel oil engine is not a reliable type of drive, that the maintenance costs are high and that the depreciation is greater than for other types of equipment.

It is admitted that without dependability, low fuel and operating costs are not of much value, for the cost of a few service interruptions would tend to offset any gain in reduced operating costs. As a matter of fact, however, the Diesel engine is an extremely dependable machine, the maintenance costs are low and the life of the equipment is long. When the Diesel engine was first developed, and during the early years of its use, some mechanical troubles were experienced, such as crankshaft breakage, cracked cylinder heads, failures to start properly and service interruptions due to improper combustion. These failures are, however, now only matters of history, for the improvements in Diesel engine design and manufacture have been fully as great as they have been with the automobile engine and it is as unfair to compare the present day engines with the early types as it would be to compare the modern automobile with those of an early era.

The 2-Cycle vs. the 4-Cycle Engine

One of the advances which have been made in Diesel engine practice has been in the development of the 2-cycle solid injection type on account of the mechanical and operating simplicity of this design. The 4-cycle engine has both inlet and exhaust valves, which require care in setting to produce the best efficiency and which must be frequently ground in order to keep the engine in good operating condition. Low grades of fuel oil, particularly those of a heavy, sticky consistency, or containing a considerable sulphur content, cause trouble

with the valves due to carbon or to corrosion.

The early Diesel engines also required the use of high pressure air for atomizing the fuel and this further complicated the construction. A multiple stage air compressor, which was necessary to furnish this high pressure air, added another feature of equipment to be looked after and the adjustment of the amount of air injected with the fuel required considerable care. The air injection engine has in both 4-cycle and 2-cycle types, of course, been improved in its mechanical design and is being used successfully, particularly in connection with large Diesel engines. Both in this country and abroad, however, the trend has been distinctly towards the development of 2-cycle solid injection types and it appears that the engine of the future, even in the larger sizes, will be of this type.

In order to understand the reasons which lie back of the simplicity of the 2-cycle solid injection Diesel engine, it is necessary to have some idea as to how this type operates. The new type "Y" Diesel oil engine, which has recently been developed by Fairbanks, Morse & Co., is an example of a late design which will be used for illustration purposes.

How a 2-Cycle Solid Injection Engine Operates

Referring to the cross-section of this engine, the first thing which will be noticed is the absence of complicated parts. In the 2-cycle engine there are no inlet or exhaust valves, as the piston performs these functions. It will be noticed in the illustration that the piston is in the lower dead center position. On its way down to this position the air entrapped in the crank case, which has come through the screen as indicated by the arrows, is slightly compressed and when the air inlet port is uncovered by the piston this air flows up through the passageway and clears the cylinder of the gases due to the combustion.

On its return stroke, the piston covers both the air inlet and exhaust ports and the charge of fresh air is compressed in the cylinder. As the piston approaches the top of the cylinder, the injection of the fuel oil takes place through the nozzle into the auxiliary combustion chamber. The air which is being compressed rushes through

the neck of this chamber and meets the spray from the fuel nozzle and aids in breaking up the fuel into a finely atomized state. In the meantime, the piston has been moving up and the compression pressure has reached about 500 lb. per square inch, which raises the temperature of the charge to practically 1000 deg. F. Ignition then begins and the burning gases expand through the neck of the auxiliary combustion chamber into the cylinder proper where combustion is completed.

It can be seen from this that no ignition devices are required, as the heat of compression fires the charge. There is no explosion in any sense of the word, for the fuel burns at a constant pressure. As the piston moves on its downward stroke, it first uncovers the edge of the exhaust port and the burned gases pass out through this port and the pressure of the cylinder is lowered to practically that of the atmosphere. When the piston moves slightly farther it uncovers the air inlet port and the air which has again been slightly compressed in the crank case flows through the cylinder, thus clearing out the gases of combustion.

It will be noted from this brief description of the operation that the 2-cycle engine receives a power stroke at every revolution of the crankshaft. In the 4-cycle engine, there is a power stroke at every other revolution, since the piston on its upward travel must force out the exhaust gases through an exhaust valve which is timed to open at the proper moment. On the down stroke the piston on the 4-cycle engine pulls in a fresh air charge through the air inlet valve, which is also timed to open at the beginning of the downward stroke. On the next revolution the charge of air is compressed and the fuel is injected, combustion occurs and the piston again travels down on the expansion of the power stroke.

Governor Details and Lubrication

In addition to the design of an engine cylinder, the arrangements for admitting scavenging air and for injection of the fuel, there are many other details which affect the dependability of a 2-cycle solid injection Diesel engine. One important feature is in the arrangements which are provided for pumping the fuel to the injection nozzle, both as to the quantity of fuel pumped and the regulation of the time of such injection.

In the engine just described the fuel injection and governor unit is mounted at the end of the engine, as can be seen from the general view. Each cylinder has a small fuel injection pump and the amount of fuel which is pumped to the cylinder is accurately controlled by the governor in accordance with the load on the engine. The engine is started by compressed air and the control for this starting and the control for the fuel are also located on this fuel injection and governor unit. In other words the entire control of the engine is located at one point.

Another detail which has an important bearing on Diesel engine dependability is in the arrangement which is provided for lubrication. In the early days, entire dependence was placed on the use of oil cups and oil holes and the oil can was an important part of the operating equipment of the engineer. In the modern Diesel engine, however, the operator is relieved of any such duties, as the lubrication is entirely automatic and is not dependent on the personal efficiency of the operating force. The mechanical lubricator, which shows as the rectangular box located at the end of the engine, as shown in Fig. 2, is driven by the engine and every bearing surface is lubricated with just the proper amount of oil. Aside from the fact that the engine is properly lubricated and dependability in operation is insured, the quantity of lubricating oil used is also reduced. In the early Diesel engines the cost of lubricating oil sometimes almost equalled the cost of the fuel oil consumed. Automatic lubrication, with consequent reduction in waste, has meant that it is possible to guarantee 2000 b.h.p. per gallon of lubricating oil, which is about one-fourth of that required by some of the early engines.

Better Manufacturing Methods

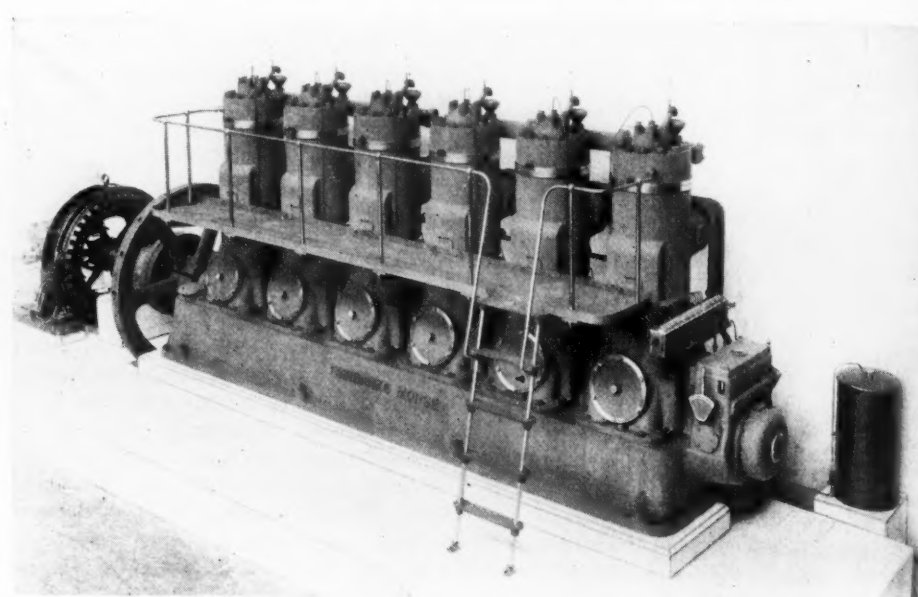
While the increased dependability of the Diesel oil engine may be partly attributed to improved designs, it is also important to know that improved manufacturing methods have had a share in this improvement. One of the troubles experienced in the early engines was in connection with crankshaft failures. Many engineers thought that this was due to the inherent characteristics of Diesel engine operation, but later experience has shown that it was due almost entirely to lax manufacturing methods.

Crankshaft manufacture is a metallurgical problem and by the adoption of metallurgical methods it has been possible to produce crankshafts which will stand up in service. In the Diesel engine, which has just been described, the specifications for crankshaft steel call for pouring the ingot in a special mold, so that the metal runs in at the bottom and rises to the top. This top metal comprises 30% of the ingot and must then be cropped off and discarded. The ingots are then heated in furnaces and the shaft is worked out into rough shape under a huge hydraulic press. This operation refines the metal through its entire cross-section, as is

not the case where drop hammer methods are used.

Heat treatment is under the control of the laboratory and the treatment for each shaft is determined by the actual analysis of a bar taken from the shaft. Micro photographs show the grain structure both before and after heat treating and the physical and chemical characteristics are checked for every shaft.

It would be possible to elaborate on this subject of manufacturing refinements, but space will not permit. The point to keep in mind is that the modern Diesel engine is dependable, not only from the standpoint of design, but also because of the care which is taken in building it. As a result, cracking of cylinder heads and breakages of



Modern 6-cylinder Diesel engine direct-connected to electrical generator

crankshafts and other such troubles have been eliminated.

On account of this mechanical dependability repair expense is very low. With the possibility of crankshaft breakages and cracked cylinder heads eliminated there is not much else in the case of the 2-cycle solid injection engine which will go wrong. In fact, records of installations show in a great many cases where the repair expense has been under \$100 a year for periods of many years.

Probable Life of Diesel Engines

One of the points which always comes up for consideration is the probable life of a Diesel engine. This life has a direct relation to the dependability of the unit and it also depends upon a consideration of obsolescence. Mechanical equipment, such as steam engines and motors, do not wear out, but rather become obsolete because new types of equipment are brought out which are so much more efficient that it is no longer profitable to keep on using the original installations. The whole history of steam power plant development is full of instances

where steam turbines have only been operated three or four years and then have been replaced by more efficient machines.

The Diesel engine, however, is so nearly a perfect machine from a thermal efficiency standpoint that the room for improvement is not very large. For that reason most of the improvements have been along mechanical lines to insure greater dependability in operation.

In spite of the fact that great strides have been made in improving steam equipment, the fuel efficiency of the largest steam station in the country does not even come close to the fuel efficiency of a 50-hp. Diesel engine. On account of that fact a Diesel engine does not become obsolete and there is no need to replace it from that standpoint.

Under reasonable operating conditions the engine should operate almost indefinitely and certainly an assumption of a life of 25 years is very reasonable. As a proof for that statement, it is interesting to note that most of the original Diesel engines, which were built in the country around 1900, are still in operation, although they certainly will not compare mechanically with present day units. The fact that these old units are still operating efficiently gives some indication as to what life may be expected and it also indicates that the cost of obsolescence is a factor which need not be considered. In that same interval practically all steam engines, steam turbines and electric motors have been replaced several times, but those old Diesels continue to operate at a fuel consumption which is far under the most modern steam plant of today.

Diesel Engine with Special Features

The increasing interest in the application of Diesel engines to a wide variety of power problems comes from the increased dependability of these prime movers due to the

constant mechanical improvement of the designs. Improvements have come about as a normal progress where the experience in the field has shown the advantages to be secured by such changes.

This progress is illustrated in the design and building of the Diesel engines of Fairbanks, Morse & Co. The former type "Y" engine might be termed a moderate-compression Diesel, that is, it required the use of a heating torch for starting, although after being started up the fuel was ignited solely by the heat of compression. The service which the engine of this type gave is shown by the fact that nearly 800,000 h.p. are in operation. Normal progress, however, indicated that an engine which would start without the aid of auxiliary ignition devices was an advantage and so Fairbanks, Morse & Co. has brought out the improved design.

No changes have been made in the general type of engine, as the 2-cycle principle has been adhered to and the combustion scheme is based on solid injection of fuel as in the former type "Y." The engine operates under a compression of 500 lb. and the increased heat due to this compression fires the fuel without the aid of a torch when starting.

Piping has been eliminated or enclosed; the control has been simplified, and what few adjustments there are have been made more accessible. These changes have, however, been brought about without sacrificing in any way the simplicity of construction and the reliability of operation.

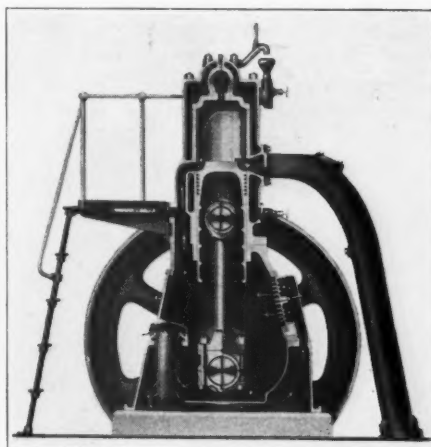
At the present time the engine is built in ratings of $37\frac{1}{2}$ and 50 h.p. for the single cylinder unit; 75 and 100 h.p. in two cylinders; 150 h.p. in three cylinders; 200 h.p. in four cylinders; and 300 h.p. in six cylinders. The former policy of rating the engines on a very conservative basis has been followed as shown by the fact that the mean effective pressure is about 300 lb. per square inch.

The primary consideration has been to develop an engine of the greatest reliability with low maintenance costs, maximum accessibility and one which is simple to operate. Fuel economy was also carefully considered, although no sacrifices were made in ultimate performance, to secure the lowest possible test consumption of fuel. The tests which have been conducted show a fuel consumption of 0.42 lb. of 18,000 B.t.u. fuel oil per brake horsepower at full rated load. One of the characteristics of the engine is that the fuel consumption curve is practically a straight line on ratings varying from 75 to 120% load.

From the sectional view shown, it will be noted that the fuel is sprayed into a combustion chamber. This part of the design is quite similar to the former design except that certain improvements have been made in the shape of the chamber and in the neck leading to the cylinder. One advantage of this combustion chamber

is that the air, on the compression stroke, rushes through the neck of the chamber and meets the atomized spray from the injection nozzle. The turbulence caused by this meeting of the air and fuel aids in preparing the fuel for complete combustion and also holds the charge in suspension. Due to this thorough preparation of the fuel the final burning is accomplished without an initial rise in pressure and results in true Diesel cards. This system also eliminates the need for high injection pressure or a complicated injection nozzle of a type where the oil is sprayed through extremely fine holes.

When the piston reaches the end of its stroke, the temperature of the fuel charge in the auxiliary combustion chamber is raised to the ignition point and combustion begins. The hot gases then expand through



Cross-section of new Diesel engine

the neck of the chamber and combustion is completed in the cylinder. In this way complete combustion is obtained as shown by the clear exhaust from light load to over load conditions. Moreover, the combustion does not cause any rise in pressure above the compression pressure, and the expansion is, therefore, similar to that of steam.

The fuel injection system is of the same general design as that which proved so satisfactory in the former engine with the exception that the pumps are grouped on a pump deck and enclosed in a case which serves as the fuel oil reservoir. The change has provided a more compact, and yet accessible, arrangement since it eliminates suction piping. By having the fuel pumps submerged the possibility of them becoming air bound is prevented. This fuel injection system, governor and the complete control of the engine centers in a unit mounted at the end of the engine as shown at the right in the view of the engine.

Starting is accomplished by means of compressed air. This air is stored by an auxiliary power compressor, in steel tanks of sufficient capacity for several starts. The pressure used for starting is approximately 200 lb.

Another important point in Diesel engine design is in the arrangements which are pro-

vided to eject the burned gases at the end of the expansion stroke. One of the improvements which has been made in the new design is that this scavenging air is transferred from the crank case to the cylinder through a passage outside the water jacket, thereby eliminating the necessity for air ports in the pistons and allowing the cylinder to be completely water-jacketed for its entire length.

Reference to the sectional cut will give an idea as to how the scavenging air circulates through the base and to the cylinder. Before the opening of the air inlet or scavenging ports, which occurs shortly after the opening of the exhaust ports, the exhaust pressure drops to virtually atmospheric pressure. The air which has been compressed to a low pressure in the crank case, enters the cylinder when the scavenging ports are uncovered and is deflected by the piston to the upper portion of the cylinder, clearing out the remaining burned gases and charging the cylinder with fresh air.

This scavenging air is supplied by the piston and crank-case acting as a pump. Upon the upstroke of the piston, air is drawn through a screen and automatic air valve, into the crank-case and is compressed upon the working or downstroke as previously mentioned.

Cooling Water Circulation

Cooling water is introduced into the jacket of the head at both a top and bottom connection with a result that the whole jacket has a practically uniform temperature. The ridges of the cylinder ports are also cored for water passages and are thus kept at a uniform temperature. At the cooling water outlet at the top of the cylinder head a spout is provided that discharges into a water header. This arrangement gives a visual check upon the water circulation. Where the cooling water supply is limited and a recirculation system is necessary, a closed connection from the cylinder head is used. In either case thermometers are provided for checking the cooling water temperature.

In the new design several changes have been made in the lubricating system. The new system is entirely automatic, consisting of a double lubricating oil pump and an outside filter. The lubricating pump supplies oil to the mechanical lubricator governor case, and main bearing wells. The governor case and main bearing wells are interconnected and the oil is maintained at a constant level in them by the lubricating pump.

Used oil drains from the crank-case to the oil sump and is pumped from this sump to the filter. This filter is entirely separate from the engine and is an efficient two-compartment type of large size, permitting the slow settling and filtering of the oil. Clean oil only is pumped from this filter back into the engine. One of the rather unique features of the lubricating system is the entire absence of oil caps, grease caps or oil holes.

Accidents Can Be Prevented

Education Will Train the Men to Be Thoughtful,
and Most Accidents Come from Thoughtlessness

By R. N. Van Winkle

General Manager, Hawkeye Quarries, Cedar Rapids, Iowa

IN a previous article, entitled "Who Pays for Quarry Accidents," suggestions were made for reducing the cost of compensation insurance to the quarryman and the ideas there advanced were only a few of the ways of reducing the cost of workmen's compensation. Still another way or means is to prevent accidents, for the prevention of accidents means the saving of money and should be directly reflected in lower rates made by insurance companies on workmen's compensation to quarry operators.

Accidents can be prevented. This statement is made with all positiveness and sincerity and unless you yourself believe it wholeheartedly and enthusiastically you will doubtless make a poor exponent of accident prevention and, moreover, be an uninterested reader of the balance of this article. As proof that accidents can be prevented, may

their recent publication of quarry accidents in the United States for the calendar year of 1922, which are the latest figures available, show that of the 79,081 men employed in the quarrying industry, 11,839 accidents occurred, and 132 met death, leaving 63 widows and 126 orphans. It is interesting to note the causes of these deaths and accidents, and by so doing bring to your attention the relative hazards of the different employments or operations in the present-day quarry. Following is a list of the different causes resulting in fatal and nonfatal accidents listed according to their respective hazards.

- | | |
|--|--------------------------------|
| 1. Handling rock at face | 8. Explosives |
| 2. Flying objects | 9. Timber and hand tools |
| 3. Haulage | 10. Drilling |
| 4. Falls or slides of rock or overburden | 11. Nails, splinters, etc. |
| 5. Machinery | 12. Burns |
| 6. Falling objects | 13. Electricity |
| 7. Falls of persons | 14. Boiler and tank explosions |



Hanging on cars is a fruitful source of accidents

I cite you to one particular plant of one of our country's biggest steel companies, where lost time cases per month were reduced from 3.62% in 1914 to .36% in 1922? The difference was directly due, so they advise, to safety methods and education. In another large industrial plant they have by intensive safety campaigns experienced the reducing of accidents from 20% to as much as 70% in a three-year period, 1920 to 1923. Many other cases could be cited, but the causes and remedies for accident prevention are what we, I believe, as operators, are most vitally interested in.

Relative Hazards

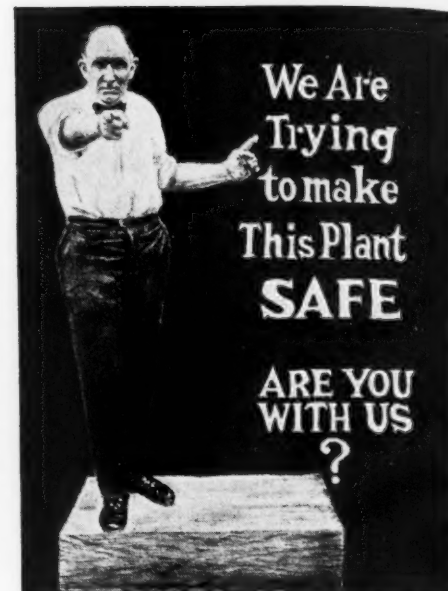
The United States Bureau of Mines in

It is possible from the data furnished by the United States Bureau of Mines in the above publication, to further analyze these accidents and thereby show just how and where some of them occurred.

Explosives. For instance, during the period covered by the report for the year 1922 were the direct cause of 36 deaths and accidents both fatal and nonfatal resulted from the charging and loading of explosives. More proof that familiarity breeds contempt in the handling of explosives.

Haulage. The primary cause of accidents under this heading were railroad cars and locomotives.

Flying objects, which takes second place in the above list as a hazard around quar-



Safety posters, frequently changed and kept clean, are important

ries were directly traceable to flying objects caused by sledging operations.

Machinery. The steam shovel ranked first in the causes of accidents under the heading machinery.

"Thoughtfulness" is Prime Preventive

If accidents are preventable, which they unquestionably are, the cause is the first thing to find, and it has been found that carelessness is the direct cause of practically every accident and the common term "carelessness" is more truthfully defined by the word "thoughtlessness." It would seem then that the great universal safeguard against accidents is thoughtfulness. A campaign of education to teach thoughtfulness is then the principal solution of accident prevention and it is the purpose of the remainder of this article to give ideas and suggestions taken from the writer's observation for combating needless accidents in the quarry industry.

It has been found that the majority of accidents are not due to physical hazards, but are due to mental hazards, the greater part of which can be overcome by education, not the highbrow sort which goes over the heads of the majority of men you want to reach, but the simple methods of education which have been tried and found effective by others. Make use of your own home-made ideas in teaching, which will have a particular appeal to your own men. In putting across your safety work it is not going to stick, no matter how hard you work, unless you try to understand your men and get down to the human element.

"Seeing is Believing"

Experience has taught us that what a man sees makes more impression than what he hears, so a safety bulletin board, attractive in appearance and kept clean and fresh with safety posters, which should be furnished by the company carrying your workmen's compensation insurance, or which can

be obtained from the National Safety Council, is one of the best mediums of education. Safety signs applicable to the quarry industry can be obtained in colors on metal, either plain or enameled, from companies who make a specialty of manufacturing such signs, and such signs and posters have a wonderful effect and are a worthwhile investment.

Teach your men that we in the quarry industry are not giving Congressional Medals or Distinguished Service Crosses to the men who risk, not only their own life and limbs, but the lives and limbs of their co-workers,



The steam shovel ranks first in machinery accidents

in the hazardous business of taking chances and the man or employee who is injured by continually taking chances in this business of ours should in no way be classed as a hero as he often wishes to appear to his fellow workers, but should be rated as a dangerous man to retain in your employ and a dangerous man to work with as a partner. There is, of course, a first time for everything, but the writer has found from his personal experience that the man or employee who continually gets hurt usually has, on investigation, a past record of injuries. He is thoughtless, absent-minded, as are 75% of the people who get hurt. He is a good man to be rid of.

In the promotion of your accident prevention of safety first work patience and constant teaching are absolutely essential and if you were to hire 100 men you would find that you had 100 different temperaments and 100 different dispositions; so to handle them intelligently and successfully and to get over to them your safety first ideas you will find that they must be handled in a 100 different ways. The statement has been made and is true that a man is six times as liable to in-

jury in the first month of his service as he is in any other thirty-day period, so use judgment in placing new men in hazardous jobs too quickly; let them become acclimated so to speak.

A plan to impress upon your clerical force and employees and to keep continually in their minds accident prevention is to require a detailed report of each and every accident or injury, no matter how slight or trivial. This requires time on the part of your clerical force and also requires the injured employee to come to the office after working hours to be interviewed for the detailed information for this report and in time you will find that this procedure becomes irksome on the part of both the clerical force and the employee, but if they are held right to it, as they should be, will tend to eliminate accidents. Still another plan which has brought results is, for a time at least, to make every injured man report personally to the superintendent or man in charge and make him report where and why he got hurt.

Avoid an Untidy Plant

Above all do not neglect to keep your own house in order, for it is hopeless to expect a quarry which presents an untidy appearance with machinery, scrap and rubbish piled around, to have a very good record as regards accidents. One of the first requisites toward accident prevention is to have your quarry and property have a neat, tidy appearance and so maintain it. It is up to you to make your quarry safe and to keep it safe, Mr. Manager, or Mr. Superintendent, and no one else will, or can do it for you.

A big factor in the cause of accidents is the feeling which is sometimes quite general among men; that accidents happen to the other fellow, but not to me. Dispel this idea immediately.

There are many appliances which are conducive to education, also conducive to a general accident prevention and a safety atmosphere around your quarry and if you will provide a first aid cabinet, electrical safety switches of the enclosed type, insulated platforms in front of your electrical switches and starting boxes, reflex water gauge glasses on your locomotive and steam shovel, and explain to your employees that these things are being installed as a matter of safety and for their protection, they will eventually become interested and become believers and advocates of safety first, last and always.

One more thing the writer wishes to touch briefly upon in this article, and that is the doctor or surgeon who treats your injured employees. Do not be satisfied with any doctor or surgeon who may be appointed by the insurance company carrying your risk, but make it your business to see that a man is appointed who has the interests and the absolute welfare of your men at heart; a man who is a real human being to his patients. This doctor or surgeon, if the proper sort, can by actual personal contact

with your employees do wonders in the promotion of safety, which will directly be of benefit to you and your men.

The American Radiator Company, in looking around for some sort of a motto or name that would express what they were looking for in their safety work, came across this: "Our aim is that our workman shall live to enjoy the fruits of his labor; that his mother shall have the comfort of his arm in her age; that his wife shall not be untimely a widow; that his children shall have a father and that cripples and hopeless wrecks who were once strong men shall no longer be a by-product of industry." This expresses forcibly the ideal which we as quarrymen can and should strive to attain in our safety work, as the safety movement is one of the greatest constructive movements of modern times.

New Rock Crushing Plant Being Built at Rock Hill, W. Va.

WORK on the new rock crushing plant to be operated by the C. and J. Camp Co. at Rock Hill, W. Va., is progressing rapidly under the direction of M. J. Dixon, superintendent.

A high tension power plant is being installed and a railroad spur about a mile long is under construction, connecting the quarry with the A. C. L. R. R.

The quarrying camp will be complete from commissary to hospital and the land is being cleared by laborers and quarters are in process of construction.

The capacity of the plant will be about



Sledging is the cause of most accidents from flying objects

1000 tons every 10 hours. The deposit of rock to be worked covers an area a mile long and from 400 ft. to half a mile wide.—Huntington (W. Va.) Herald-Dispatch.

Hints and Helps for Superintendents

Notice of Shipments

V. H. KRIEGSHABER AND SON of Atlanta, Ga., enjoys the co-operation of manufacturers, whose products they sell, in the particular short-cut submitted by W. V. Kingdon, who comprises the "Son" part of V. H. Kriegshaber and Son, to *Building Supply News* of Chicago. It is something that any supply man can use.

This is an ordinary government post-card on the message side of which is printed the form reproduced herewith. Blank spaces are to be filled in by the producer who ships the car of material direct to consumer at direction of V. H. Kriegshaber and Son. This is how Mr. Kingdon describes the system:

"Here is a post-card we have found quite a short-cut for giving information to contractors and customers on shipments of carload materials.

"Where a single carload of material is

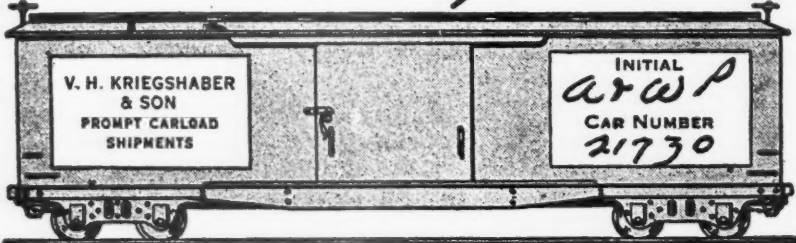
A New Hat for a Good Idea!

SPRING is coming. You'll need a new hat. Brothers Superintendents and Foremen, we'll pay you \$5, or the price of a fairly good hat, for every good idea—photograph, pencil sketch, blueprint, or letter, out of which we learned editors can build a "Hints and Help." Maybe two or three good ideas will net you enough for your wife's Easter bonnet.—The Editors.

bill of lading can be gotten to a customer and by use of this card the customer has advice of shipment immediately."

Now here is an idea that is actually working for a dealer with greater satisfaction to manufacturer, dealer and customer.

This car containing 80,000 # Gravel



V. H. KRIEGSHABER & SON
PROMPT CARLOAD SHIPMENTS

INITIAL
AWP
CAR NUMBER
21730

Was shipped on Dec. 29, 1924.

Consigned to General Contracting Co.

If not received promptly please advise us.

V. H. KRIEGSHABER & SON 227 PEACHTREE STREET
ATLANTA, GEORGIA

This is a reproduction of the card which V. H. Kriegshaber and Son, Atlanta, Ga., asks manufacturers they deal with to mail to every customer of carload material. Each order from Kriegshaber to a producer for a carload shipped direct is accompanied by one or more of these blank cards. The manufacturer fills them in and mails as each carload is shipped. It notifies the customer of car's arrival and saves delays

to be shipped by one of our manufacturers direct to our customer, one of these cards is enclosed with our order to the mill. The day that car is shipped, the manufacturer mails the card to our customer. Where a number of carloads are to be shipped at regular intervals to the same customer or a number of customers, we supply the manufacturer with enough cards to take care of all.

"This is quite a short-cut, as sometimes it is two or three days before invoice and

Suggestions

HOW have you made use of your welding outfit?

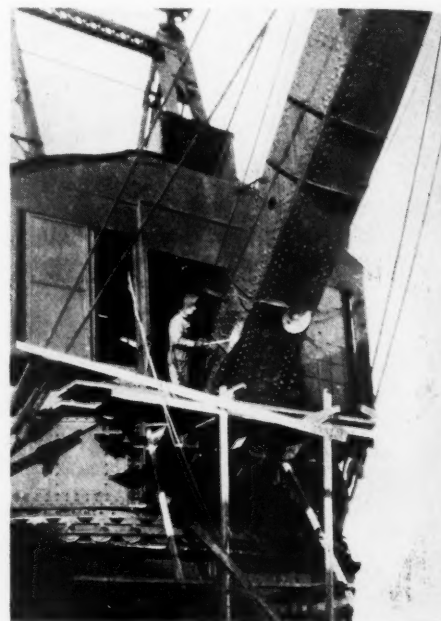
How are you preparing for the season's business?

What's your pet kink or invention?

No prize competition about this. We pay \$5 for every idea we publish.

Repairing a Steam Shovel Boom by Welding

A STEAM shovel, details of which are shown in the pictures, was being used for stripping. In the course of operations the boom was overstrained and several cracks



Repairing a steam-shovel boom by welding



Close-up of welding operation

appeared near the base, extending outward from the rivet holes. This, of course, required immediate attention. It was really a structural iron worker's job, but a structural iron-worker is seldom found on a shovel crew. Accordingly, the owner of the shovel made use of his oxy-acetylene equipment.

The rivet heads in the cracked plates were cut off with a blowpipe and the rivets backed out. Next, the cracks were veed nearly to the bottom of the plate, using the same tool, and finally welded. Only an hour or two were required for the job because the contractor had an oxy-acetylene outfit. Had it been necessary to replace the plate or make a splice by the old methods, the shovel would have been out of service much longer, waiting for new material and special tools. It may be remarked in passing that this is only one of several instances, which might be cited, where cutting and welding blowpipes served to replace a whole shop full of metal working tools.—*Oxy-Acetylene Tips*.

Building a Jig

JIGS are more and more coming into use in the rock products fields for washing the coarser sizes of some materials. At least two good sized plants have been built in which jigs are used for washing gravel to remove lignite, bark, sticks and similar deleterious materials. One of these, the

shows two workmen building a jig at the plant of the New Jersey Zinc Co., Cartersville, Ga. It is not to be used for washing zinc ore, however, but barytes. Barytes in this field occurs in boulders and pebbles in clay, so the operation is much like washing sand and gravel.

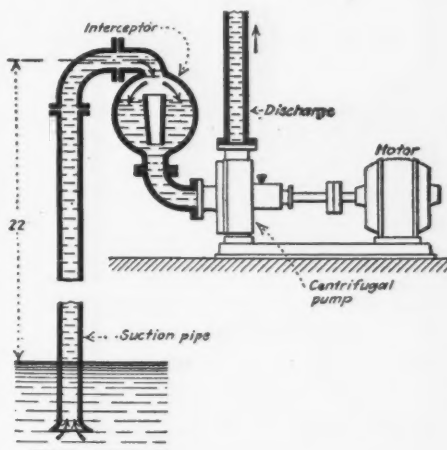
The jig shown is a three-compartment machine. The feed enters at the high end and flows out at the low end. The men are standing in the compartments which contain the screens over which the ore and water flows. The compartments in the rear contain the plungers, which are moved up and down by the eccentrics on the shaft behind them, the motion of the plungers making the pulsating current that moves up and down through the screens.

This jig body is being built of 2x4-in. pieces laid up in "cribbing." Candle wicking is used between the pieces to make the joints water-tight. Reinforced concrete has also been used for jig bodies with great success. The concrete has to be coated with a water-proof composition.

Device for Starting a Centrifugal Pump Without Priming

MOST engineers are familiar with the difficulties often encountered in starting up centrifugal pumps when they are located very much above the water they are lifting.

is interposed between the centrifugal pump and the suction line, enabling the pump to be started up without any preliminary priming irrespective of the suction lift. This pump lifts water from a dirty water sump



Starting a centrifugal pump without primary

22 ft. below, discharging into an overhead tank.

The interceptor consists of a closed steel plate cylindrical vessel located on the suction line and somewhat higher than the latter, the inlet to the device being at the top and the outlet at the bottom. Between these two orifices is fitted a conical pipe as shown in the end view of the interceptor. Before the pump is started up the upper end of the discharge pipe and the whole of the suction pipe is full of air, the only water being that in the centrifugal pump itself and in the interceptor. When the pump is put into operation it derives its water from that in the interceptor, thus creating a partial vacuum in the suction pipe. This vacuum causes the water to rise in the suction line, and the dimensions of the interceptor are such that water from the sump starts flowing into it before it has been emptied of its primary water by the pump.

The water from the suction line, passing into the interceptor, operates as a kind of ejector, taking with it some of the air through which it passes before entering the cone. Very soon practically all the air which was in the suction pipe has been taken through the pump, and the interceptor is nearly full of water, which is the usual state when the pump is running. When the pump is stopped the water runs back until the level in the discharge line is the same as that in the interceptor, the air remaining in the latter being sufficient to prevent any siphoning action the vacuum is broken and the water in the suction liner runs back into the sump, leaving both the pump and the interceptor full of water.

With the aid of this device no difficulty at all is experienced in operating the pump, which starts as easily as if it had been drowned.—*Engineering News-Record*.



Building a jig for removal of lignite from sand and gravel at Memphis, Tenn.

plant of the Central Sand and Gravel Co. at Memphis, was described in the Annual Review number of *Rock Products*, December 27, 1924.

The jig is a somewhat cumbersome machine to ship as a whole, so it is customary for those who wish to install one to buy the iron, steel and brass parts and to build the rest of it at the plant. The picture

Whenever possible, such pumps are operated "drowned," but this is not always possible with the result that water has usually leaked away through the foot-valve and left the casing full of air.

In this connection a device known as an interceptor installed at one of the London, England, power stations will prove of interest. The drawing shows the device which

Present Status of Kelley's Combination Tariff

Correspondence Between President Otho M. Graves of the National Crushed Stone Association and the Interstate Commerce Commission

BULLETIN 104, dated February 20, 1925, of the National Crushed Stone Association gives the following correspondence between President Otho M. Graves, of the Association, and George B. McGinty, secretary of the Interstate Commerce Commission:

President Graves' Letter

"At one of the general sessions of the convention of the National Crushed Stone Association held in Cincinnati January 12-15 inclusive, the following resolution was adopted:

"WHEREAS, Many shippers of crushed stone in the Central Freight Tariff Region view with concern and anxiety the proposed cancellation of Agent Kelly's Tariff No. 228, because of the probability that the joint through or proportional established by individual carriers' tariff in lieu thereof would not be as comprehensive as the application of the present combination rule, resulting thereby in the interruption to trade and loss of business and that through or proportional rates subsequently established would be higher than contemplated by the Kelly tariff, and, WHEREAS, This association understands that both the Inter-State Commerce Commission and the carriers are desirous of effecting cancellation of this tariff for reasons with which this Association is not unsympathetic, but, furthermore, understands that the cancellation of this tariff will not be permitted until and unless sufficient joint through or proportional rates are established in lieu thereof, as should be satisfactory to shippers, on the basis of the Kelly combination rule, and that the shippers should be freely consulted to effect this end.

"THEREFORE, BE IT RESOLVED that this Association respectfully ask the Commission if the understanding of this Association as herein set forth is correct as to the provisions governing the effecting of the cancellation of this tariff."

"I recall with appreciation the information you kindly furnished me during the past few months in regard to the attitude of the Commission relative to the proposed cancellation of the Kelly Tariff and we will be even further indebted to you if you will inform me as to whether or not the understanding of the Association of the attitude of the Commission as set forth in the second paragraph of the foregoing resolution is substantially correct."

Mr. McGinty's Reply

"The Commission has the assurance of the

carriers that in the cancellation of the combination rule tariff and its application to the numerous tariffs which makes reference thereto, that the carriers will undertake the publication of rates, either joint or proportional, on basis set forth in the combination rule tariff before any attempt has been made to cancel same. As a general proposition it is believed that this assurance is given to the Commission in good faith and that as a general proposition carriers will do what they have promised, nevertheless the interested shipper has some responsibility in the matter to see that the carrier he is particularly interested in does not, either through mistake or intentionally, cancel the rule without first establishing rates to be used in lieu thereof. Otherwise cancellations may occur and not be brought to the knowledge of the Commission before they have become effective; then it is too late and the only recourse which a shipper has under such circumstances would be the filing of a formal complaint asking for the re-establishment of the rule or the publication of joint through or proportional rates on the basis provided in the rule.

"The Commission further emphasizes that it cannot undertake to scrutinize the thousands of tariffs filed monthly to ascertain whether or not any of these tariffs have omitted reference to the combination rule or canceled the combination rule itself. It goes on to say, 'Wherever reference in a tariff to the combination rule is canceled out or omitted in the next reissue of that tariff, or wherever the combination rule in a tariff is canceled out, those shippers who are adversely affected thereby should call the matter to the attention of the Commission through appropriate request for suspension thereof filed in accordance with the Commission's rules and practice.' The Commission again calls to our attention its previous advice that 'carriers have been advised that in publishing the rates which they must publish before the cancellation of the combination rule can be accomplished, they should take into consideration the interests of the shippers along their lines and consult with them frequently concerning the points from and to which they desire joint through rates or proportional rates published in order that the combination rule may be canceled without injuring the shippers who now make shipments under the rule. If the shippers will co-operate in this respect, it is believed by the Commission that the rule may be done away with entirely without unduly burdening shippers."

President Graves Postscript

"It seems to us that the situation as herewith presented should be satisfactory to shippers of crushed stone, bearing in mind that the Association holds itself ready to properly assist any shipper if he finds that attempt is made to cancel the combination rule or omit reference thereto until joint through or proportional rates satisfactory to the shipper and on the basis of the combination rule have been issued in lieu thereof. As it is realized that proposed cancellation of the Kelly tariff is of considerable importance to many of our members, particularly to those in the Middle West, I shall be very glad to have the benefit of any comment, advice or counsel which occurs to any of our members as bearing on this situation."

Improvements at Blackwater, Missouri, Quarry

THE Blackwater Stone Co., is preparing to install new machinery in its plant at Blackwater, Mo., soon according to the *Marshall (Mo.) Democrat-News*.

The company is contemplating the installation of its own electric power system to furnish power for the work now done by steam and teams. The Missouri Pacific Ry. has had a survey made at the plant by engineers for track installation under consideration. Additional men have been hired.

This quarry recently became the property of R. Newton McDowell as noted in the Feb. 7 issue of *Rock Products*.

Fire at a Pennsylvania Quarry

THE frame sub-station at the plant of the Casparis Stone Co., at Connellsville, Penn., was damaged by fire recently with a loss estimated at \$20,000, covered by insurance, according to the *Connellsville (Penn.) News*.

The building contained three 500 kw. transformers and was burned in about 20 minutes. The employees formed a bucket brigade and saved the office building and machine shop, which are located near the site.

Arrangements were made to secure power temporarily from the West Penn. Co., and the structure will be replaced by a brick building, a statement by superintendent Hanahan indicated.

New Quarry and Plant at San Antonio, Texas

LIMESTONE rock is being quarried by Olmos Rock Co., near the West Texas Military Academy in Alamo Heights, Texas, according to a statement in the *San Antonio (Texas) Light*.

New machinery and crushers have been installed and the company is able to turn out 900 tons of crushed rock daily. E. V. Biles is the manager of the plant and Clifton George, Jr., is manager of sales for the company. The city office is at 744 Houston street, San Antonio.

Operates Four Plants on the Ohio River

Ohio River Gravel Company Conducts Dredging, Transporting and Delivery Operations at Towns in Ohio and West Virginia

THE Ohio River Gravel Co. has its main office at Parkersburg, W. Va., but it operates not only in its home town but in Wheeling, W. Va., Marietta, Ohio, and New Martinsville, W. Va.

At each of these four places it carries on a complete operation, digging the sand and gravel, transporting it to its own landings and selling by both truck delivery and by carload. In a way these are independent operations, each having a manager who has charge of both production and sales and a river superintendent in charge of the dredge

has built new tow boats and barges in the past year.

The dredges are so much alike that a description of one will serve for all. The particular dredge to be described is the "Parkersburg," which, at the time of the writer's visit, was digging in that part of the Ohio which is rich in history, the channel near Blennerhassett's Island.

On the day it was visited the dredge was anchored in a six-mile current, which made the handling of barges by the tow boat a matter of considerable skill. Everyone who

Many dams have been built in the Ohio by the government to maintain a 9-ft. stage of water at all times in the channel from Pittsburgh down. In the slack water periods of summer the river is practically a succession of pools, and barges and tow boats must pass through locks to go from one pool to the other. But when the water is higher than is needed to maintain the required depth the crests of these dams are lowered either by "bear traps" or a system of wickets and the boats pass over the dams, without locking. There is a considerable



One of the two landings at Parkersburg, W. Va., and one of the oil-driven towboats of the company's fleet

and tow boats. There are two landings in each town, each of which has machinery for unloading barges and some storage capacity beside bins for loading trucks and railroad cars.

A part of the equipment was acquired from other companies by purchase but the company had made a great many improvements, especially in the equipment at the landings, and is replacing dredges, barges and tow boats as fast as the need arises. It

knows anything about dredging rivers for sand and gravel knows that "river conditions" are the first thoughts in the dredge-master's mind in the morning and the last before he goes to sleep. And there is probably no river which is subject to such violent changes as the Ohio, as the disastrous floods of some years past attest. The storm which destroyed Lorain, Ohio, last summer brought so much rain with it that the river rose 28 ft. in a comparatively few hours.

current in the river at such times which may run six, or even seven, miles per hour in the narrower channels such as the channel by Blennerhassett's island.

The dredge "Parkersburg" is 110 ft. long and 26 ft. wide. It is of the side ladder type, and was built at Parkersburg by the Parkersburg and Marietta Sand Co., from which she was purchased by the present owning company. She was equipped by the Goodman Engine and Machine Co., Pittsburgh.

The ladder (70 ft. long) was originally fitted with one-fifth yd. buckets but smaller ones were found to be more efficient and the present buckets run 7 to the yard. They are of the elevator bucket type and have heavily reinforced cutting edges. The speed is about 25 buckets per minute and the digging is usually carried on in about 21 ft. of water. Under these conditions the dredge

side and a gravel barge on the other. Some of the gravel barges have a center bulkhead and two sizes of gravel may be loaded in the same barge if necessary.

Waste Oversize

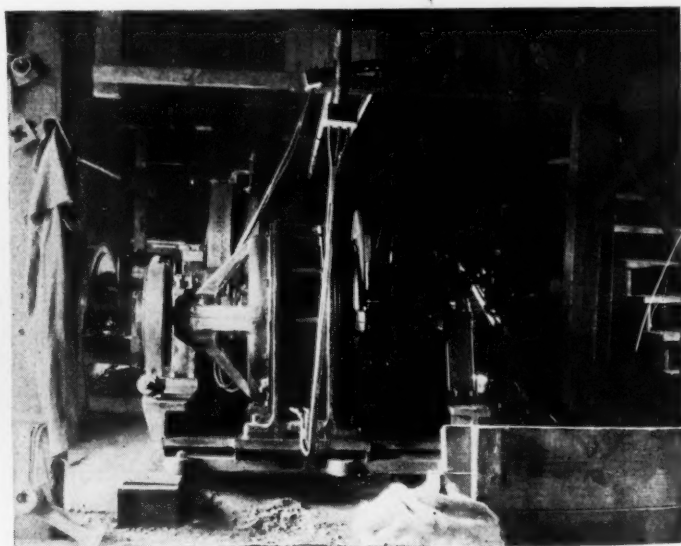
The material which is dug by the bucket line falls on a grizzly of 1-in. bars spaced 4 in. The oversize goes back to the river. The undersize goes to a screen which has

turned to the river. An arrangement of chutes permits this to be done easily.

The sand passing the $\frac{1}{4}$ -in. holes goes to a sand box or sump by a chute in the bottom of which may be placed a $\frac{1}{8}$ -in. mesh screen. When this is used the coarser grains are returned to the river and only what passes the $\frac{1}{8}$ -in. screen is saved. This is sold as plasterer's sand and it is in consider-



Left—Steel boom derrick at one of the Wheeling landings. Right—Office, tracks, and bins at one of the Marietta landings



Left—Concrete bin at one of the Wheeling landings. Right—100-hp. electric hoist at a Wheeling landing

in a good month, during the summer season, will produce 24,000 to 25,000 yd.

There are four spuds and to handle these and the lines there are two "nigger engines," one forward and one aft. These engines not only move the boat by pulling on lines attached to anchorages but also serve in handling the barges by tow lines. The dredge works with a sand barge on one

first a sand section with $\frac{1}{4}$ -in. holes, then a short section with 1-in. or $1\frac{1}{4}$ -in. square mesh and then a section with $2\frac{1}{2}$ -in. round holes. Whenever a " $2\frac{1}{2}$ -in." gravel is wanted the finer gravel from the short section is thrown in with the coarse gravel, and whenever " $\frac{3}{4}$ -in." or "1-in." (made with either a 1-in. or $1\frac{1}{4}$ in. screen on the short section) is desired the coarse gravel is re-

able demand in this section. The unscreened sand (from $\frac{1}{4}$ -in. down) is known locally as "commercial sand," and is principally used as fine aggregate for making concrete.

Water for washing is added at the screen. It is supplied by two 4-in. pulsometers and one Nye steam pump, which works on the same principle as the pulsometer. There is a small duplex pump which is connected to

a fire hose and mainly used for washing down the decks.

The barges used with this dredge are mostly of the wooden hopper type so much in use along the Ohio. But as in every other operation visited by the writer, the wooden barges are being replaced by steel barges of the flush deck type as being cleaner and requiring no pumping out of the water

kept on the tonnage of each barge by noting the difference in the freeboard when loaded and empty and figuring the displacement. Each 32 cu. ft. of displacement equals one ton of deadweight on the barge.

The company has seven tow boats in its fleet and these have gasoline or kerosene and crude oil engines for power. Foos and Fairbanks-Morse and International and

near the river. All of these tow boats have wooden hulls.

The unloading machinery at the landing does not vary much at the different operations. There is a stiff-leg derrick which handles a 1¼-yd. or 1½-yd. clamshell bucket. Williams buckets are used in the Marietta plant. The hoisting engine is a Lidgerwood 10x12-in. in most of the plants.



Left—Landing "across the river" at Parkersburg. Right—Stiffleg derrick at one of the Parkersburg landings



Left—New concrete office building at one of the Wheeling landings. Right—Railroad bin at the same landing in Wheeling

that goes in with the sand and gravel as the barge is filled. This water is also undesirable because it adds to the displacement and there are times during the season of low water when an inch or two of draft makes considerable difference.

The barges hold 175 tons. They show a freeboard of 18 or 19 in. when loaded and 65 to 70 in. when empty. A rough check is

Primm oil engines are in use, the horse-powers running from 35 hp. to 70 hp. The company is building a new boat at Marietta, which is 55 ft. long and 13 ft. wide and which will probably have a 45-hp. Primm oil engine installed. Oil is readily obtainable at Marietta, which is an oil producing center, and the tanks on the boats can be filled directly from tanks at the wells which are

The boiler in at least one is a Donovan made in Parkersburg. At one Marietta plant there is a McMyler-Interstate steam hoist which has been changed to electric power by adding a 45-hp. direct current motor. This arrangement is liked very well. The direct current motor is particularly liked on account of its powerful starting torque, which will permit the hoist to pick up a



The dredge "Parkersburg." All of the company's dredges are of the same design. The side ladder that digs the material is at the right. The other ladder is for handling sand that has been taken out by the screen

full bucket from a state of rest.

There is a new electric Lidgerwood hoist with a 100-hp. Westinghouse alternating current motor at one of the Wheeling landings,



R. I. Stewart, superintendent at Marietta

which is also liked very well from its ease in handling.

The stiff-leg derricks are all built by the company of Oregon timber which they get in from the coast for that purpose.

Charles Corliss is president of the company, G. C. Ross is vice-president and general manager, and A. P. Turley is secretary-treasurer. Mr. Ross, the general

manager, is very well known in the sand and gravel industry of the country as he has served for some years on the board of directors. He was formerly an engineer and was in charge of a great deal of the government work for improving the Ohio river, placing dams and locks to maintain a 9-ft. stage of water.

Wolf River Sand Co. Establishes New Plant

THE Wolf River Sand Co., of Memphis, Tenn., is reported to be establishing a new sand plant on Yellow creek near Memphis. The T. L. and G. R. R. is build-

ing a mile and a half siding to the plant.

The sand deposit is said to be larger than the company's Wolf River holdings and suitable for high grade molding sand. The officers of the company are: V. A. Cordes, president, J. H. Griffith, vice president, Paul Damman, secretary and treasurer.

Bagnell Gravel Company Has New Dredging System

THE Bagnell Gravel Co., Bagnell, Mo., is having two new barges built to use in its new system for getting gravel from the Osage river. One barge will be equipped as a dredge and convey the gravel from the



R. E. Holland, river superintendent at Parkersburg

river to the other barge where it will be washed, screened and graded. From this the gravel will be transferred to the gravel pits by a derrick. It is estimated, according to the *Tusculum (Mo.) Autogram*, that about 34 carloads of gravel will be produced daily with the new equipment.



New concrete storage bins and derrick and hoist house at a Marietta landing

American Concrete Institute Meetings of Interest to Cement and Aggregate Producers

Scientifically Designed Concrete, Central Mixing Plants and the Causes of Disintegration of Concrete Are Important Topics Discussed

IN previous years ROCK PRODUCTS has given only a brief report of the meetings of the American Concrete Institute, as its readers are interested in the making of concrete materials rather than the making of concrete. But this policy can not be followed with the meeting of the Institute at the Drake Hotel, Chicago, which closed on February 27, for there were too many things discussed in which the readers of this paper are vitally interested. Many producers of aggregate are interested in concrete products and central mixing plants and all of them are very much interested in the effect of the newer methods of making concrete on the aggregate business. Undoubtedly some newer standards will be set up shortly and some new factors may be introduced. It is quite possible that we soon may see sand sold at a price varying with the fineness modulus, for example.

We may find uses for material we did not value sufficiently through the adoption of new concrete methods. One speaker at the Institute meetings told how he used fine sand in a locality where sand was dear and gravel comparatively cheap, because fine sand enabled him to use more gravel to obtain the required fineness modulus. Engineers are tending to break away from established methods in making concrete. The aggregate producer may also have to change his methods in order to follow him.

The Fineness Modulus "Will Not Bite You"

One of the papers that brought this out was that read by T. P. Watson, assistant engineer of the Pennsylvania R. R., on the concrete work on the Beck's Run Bridge, near Pittsburgh, Penn. Mr. Watson admitted that in the beginning he had small faith in the method of designing concrete by the use of the fineness modulus, but he was thoroughly converted before the job was through. And he showed all the enthusiasm of a convert in his paper. He told his hearers not to be afraid of the fineness modulus, for, "it will not bite you."

There were 5000 yd. of mass concrete and 10,000 yd. of reinforced concrete in the Beck's Run job. The aggregate used was river sand and gravel bought on the Pittsburgh market. It was measured in a Blaw-Knox batcher with allowance for bulking. To get the real density of the sand in

the batcher experiments were made in dropping sand the same distance that it had to fall in the batcher to see how the impact affected the density.

Uniformity in Aggregate Now Insisted Upon

Concrete engineers today are insisting that aggregate producers should give them a product of absolute uniformity, so that they can determine the mix and not have to depart from their figures. This may be possible but it will certainly be very expensive, as anyone familiar with aggregate production will understand. But Mr. Watson was more reasonable. He corrected his proportions of fine and coarse aggregate for every carload that came on the job in order to maintain the same fineness modulus in the mixed aggregate and did not find the work too long or tedious to be a regular field method.

Some of the mixtures obtained by this calculation he rightly said, "would make your hair curl," if you were not used to designing concrete in this way. He gave examples of some of them, such as 1-0.95-2.55, for dry material, which was corrected to 1-1.30-2.91 for the damp and loose material. Another, which was to give the same fineness modulus, and consequently the same slump and strength was 1-2.48-3.48 dry and this was corrected to 1-3.10-3.30 for damp and loose materials. Both mixtures were designed for 3½-in. slump concrete and 5.3 sacks of cement were used for one cubic yard.

In spite of the weird appearance of these mixtures, when set down on paper, test cylinders made from the concrete showed that they had the strength that they were designed to have and left no doubt in the minds of the builders that the concrete that went into the bridge was of the strength it was planned to have.

All the sand was tested colorimetrically, not to determine the presence of tannic acid or humus but to determine the presence of soft coal. The sand from some parts of the rivers near Pittsburgh contains considerable coal, and Mr. Watson did not wish to take chances with it, although he was assured that coal in small amount did no harm. Some of the sand he said, was too coarse to make a good workable mixture, and he gave the screen analysis, which showed it have a fineness

modulus of 3.47. Most of the sand had a fineness modulus around 2.40.

There were a number of other papers which had to do with the control of concrete mixing in the field. One which was listened to with great interest was by A. W. Munsell, assistant engineer of the Delaware River Bridge Joint Commission. The Delaware River bridge is the longest bridge yet attempted and the amount of concrete used is enormous. To illustrate something of the quantity required a slide was shown giving isometric views of the block of concrete in one anchorage and the Drake Hotel, in which the convention met. The block of concrete in the anchorage had about the same dimensions as the hotel. But this was not strictly "scientific concrete" for the specifications called for 1-2-4, 1-2½-5 and 1-3-6 mixtures. However, these were taken as nominal mixtures and the actual quantities used were those nearest the nominal mixtures determined by the principles of concrete design.

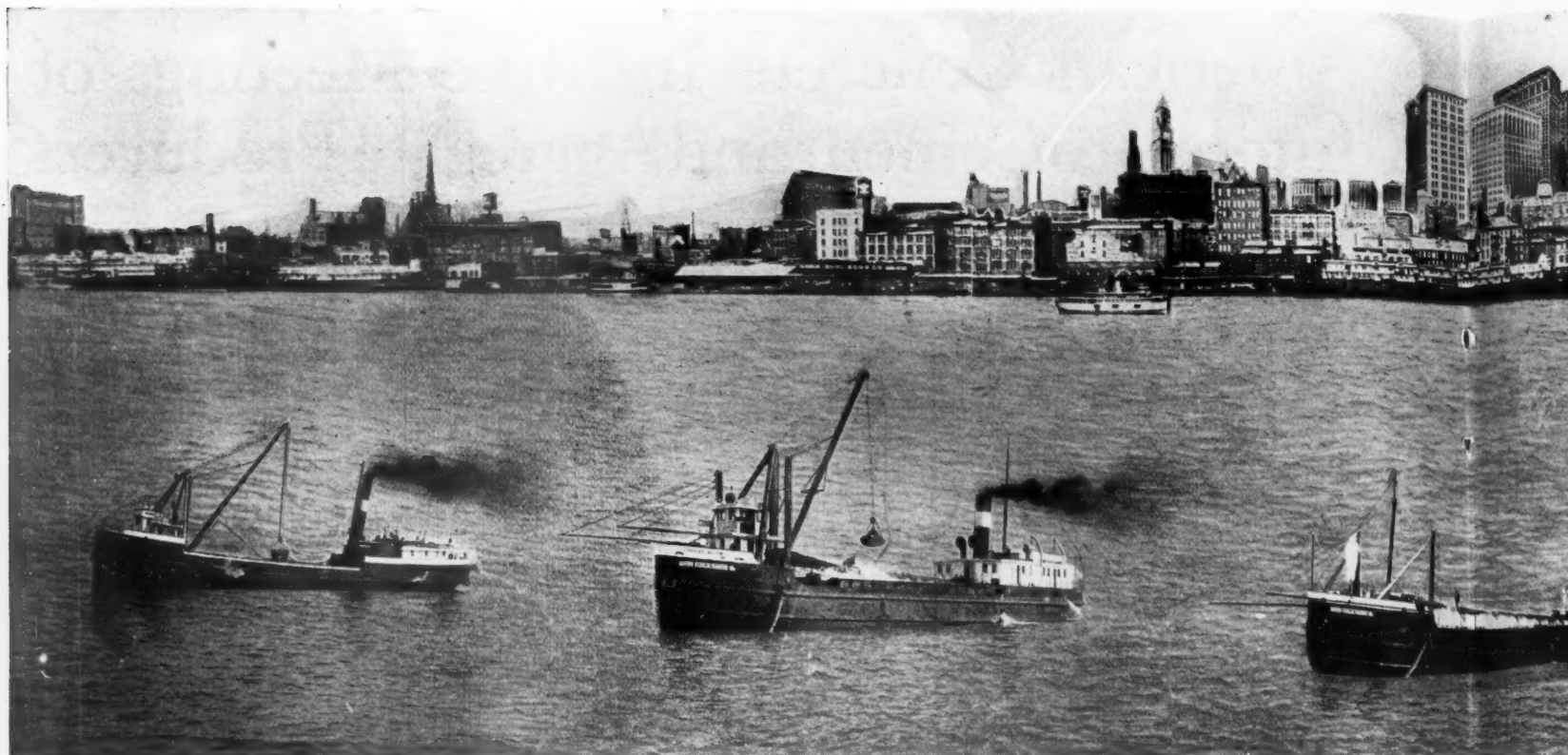
Few Rejections of Aggregate

The aggregate used on this job was sand and gravel from five companies, the greater part of it being supplied by the De Frain Sand Co. of Philadelphia. It is noticeable that in this big job, running into hundreds of thousands of yards, there were not over five rejections of aggregate.

C. P. Richardson, engineer of track elevation, C. R. I. & P. R. R., Chicago, brought out the important fact that much of a railroad's concrete work was in small jobs, done at a considerable distance from large places, and hence the application of theoretical principles was difficult. He also explained "bulking" in sand in a way that was new to many of his hearers. His theory was that moist sand bulks because of the surface tension of the globules of water with which the surfaces of the grains of moist sand is coated. The weight of the sand above is not sufficient to break this surface tension.

Of Interest to Cement Makers

A paper that will be of interest to the makers as well as the users of portland cement was, "Notes on Laitance," by R. H. Miller, in which he described his investigations of laitance made in pouring the foundations for a coal pier. That part of the cement which floated out into the water was caught and analyzed. It ap-



Sand dredging fleet of the United Fuel and Supply Co., of Detroit, Mich.—Types of sea-going "

peared to be a mixture of the finest part of the cement with a little fine sand and silt from the bottom and it had the following analysis as compared with the cement used and the handbook standard:

| | Laitance | Atlas cement used | Standard portland cement—hand book reference |
|---|----------|-------------------------|---|
| Moisture | 7.55 | | |
| SiO ₂ | 22.49 | 21.31 | 19.06 |
| F ₂ O ₃ and Al ₂ | | | |
| O ₃ | 7.56 | 6.84 | 9.76 |
| CaO | 62.40 | 62.80 | 61.23 |
| MgO | Trace | 2.64 | 2.83 |
| SO ₃ | Trace | 1.34 | 1.34 |

It was calculated that 13.2% of the cement went into the laitance.

In the speaker's opinion, it appeared that only the outside of each concrete charge that went into the forms was affected, but the result would be to have masses of dense concrete between which would be pockets of porous concrete of greater permeability. If this permeability is responsible for the destruction of concrete by sea water, or by the alkali waters of the west, then laitance spells failure. It is therefore of the greatest importance that laitance be held to a minimum.

Retempering of concrete has been found of great advantage in reducing laitance. The process consists of holding the mixed concrete several hours and then returning to the mixer and remixing without the addition of water. Concrete rettempered for two or three hours gains slightly in strength, hardens much more rapidly and shows no shrinkage if placed in the dry and does not swell when placed under water. It will not lose its fines through wash to any appreciable extent. English engineers temper concrete for as much as

five hours, and the only objection to doing this is the expense involved.

Destructive Agents

In line with what Mr. Miller had brought out in his paper was the report of Committee E-6, on "Destructive Agents and Protective Treatments," read by E. R. McMillan, secretary. This gave a detailed account of the state of various important concrete structures all of which were situated in the northern part of the United States where the effect of frost is most severely felt. Some of these structures were in a condition that might be described as perfect, although they were from 15 to 20 years old.

The cause of disintegration might be summed up in the words "porous concrete." This resulted from the following causes:

1. Excess of mixing water.
2. Deficiency in cement.
3. Dirt or excess of fine material in the aggregate.
4. Segregation of material in handling and placing the freshly mixed concrete.

The last includes laitance, or the separation of the finer part of the cement, although laitance is a symptom, the real disease being over-wet concrete.

Several pictures were shown, dams, breakwaters and canal walls principally, and the causes of disintegration were explained. Dirty aggregate played an important part in these causes. The committee's recommendation for making an impervious concrete which would not disintegrate was as follows:

Clean aggregate of durable materials, a mixture of a fair degree of richness; the use of a puddling consistency; and care in placing and curing.

In "Concrete from the point of view of Mr. Cement," Thaddeus Merriman, chief engineer of the Board of Water Supply, New York, put "Mr. Cement" on the stand and let him answer some questions in his own defense. "Crazing" was the subject of an important paper by P. H. Bates of the Bureau of Standards, in which the necessity for further study was discussed and the work outlined. This paper caused a lot of discussion. One reason why crazing is important is that portland cement plaster is now being used for interior work in which it is necessary that crazing should not occur to any extent. Two large New York hotels which are being built will have interior portland cement plaster.

Dr. Maxmillian Toch, well known industrial chemist, discussed the question: "Shall Anything Be Added to Portland Cement?" His answer seemed to be, "yes; if there is any good reason for adding anything." He saw no objection to the use of "cal," and similar compounds to increase the rapidity of hardening.

Much of his paper was given to the use of pigments and he showed several samples of beautifully colored mortars. Some of these were perfectly hardened, while others were so soft that they could be broken with the fingers. He warned the makers of concrete products and others who made colored concrete that pigment manufacturers' claims



of sea-going "sand suckers" of which there are a considerable number on the Great Lakes

were not always substantiated and that the only way to be sure of a pigment was to have it analyzed. Pigments containing sulphates should never be used.

Central Mixing Plants and Inundation

The "inundation" method has been so much discussed that the paper by A. A. Levinson, now with the Blaw-Knox Co., was listened to with interest. This is so far the most exact method of controlling the moisture content of concrete, but it has only been applied to central mixing plants as yet. The slides showed the ingeniously constructed "inundation case" and the arrangements for filling and emptying.

Central mixing plants were discussed by W. E. Hart of the Portland Cement Association. This business goes well with the production of aggregates and several aggregate producers already have such plants. Their advantage, Mr. Hart pointed out, lies in the saving of labor to both contractor and mixing company, since the latter can do the work with less men in a permanent plant. In winter work such a plant may be easily designed to furnish warm concrete without too much expense.

Mr. Hart described what he thought an ideal plant, one erected by a Chicago contractor for his own use, but which would make an admirable commercial plant. The important thing about the system employed is that both cement and aggregates were weighed and not measured. A dial scale did the weighing and colored cards set before the operator for each job showed the proportions of the mix.

Mr. Hart pointed out that cement "bulks"

as well as sand, though not from the same cause, and hence weighing the cement is important.

Weighing has a further advantage of flexibility; that is, the mix can be readily changed and "fractional" mixtures such as 1-1.3-3.6 may be weighed out as easily as 1-2-4 mixes.

He discussed the delivery of mixed concrete and the difficulty which came from segregation in transit. In his opinion mixed concrete should not have a slump of more than 4 in. if it is to be hauled more than a few blocks. Thorough mixing helps to prevent segregation and a minimum time of 1½ minutes is recommended for central mixing plants. Perhaps the greatest gain to the concrete industry in central plants lies in the fact that only the stiffer mixtures can be transported and hence "sloppy" concrete cannot be furnished.

A paper which should have caused considerably more interest and discussion did not do so because it was read only a few minutes before closing time at one of the evening sessions. This paper was, "Proportioning Concrete Materials, With Special Reference to Highway Construction," by G. W. Hutchinson, formerly of the North Carolina highway department and now with the Celite Products Co. The paper, which was preprinted, was illustrated with curves and diagrams representing years of work and a great many laboratory tests.

Mr. Hutchinson pointed out that while the arbitrary method of proportioning (such as 1-2-4, 1-3-6, etc.) is crude, it has not yet been displayed by more scientific methods.

The paper then explains the method he has developed. It says that concrete should be proportioned with a definite amount of strength per volume of completed mixture; by combining definite amounts of several definite sizes of aggregates; and with reference to a desired strength at a particular age, such combinations to secure the desired quality in the most economical way.

Tests were made by Mr. Hutchinson for both compression and resistance to impact, which he thought represented what highway concrete had to stand. An unusual feature of these strength tests was that they were all carried to a one year period and some startling differences were shown in samples tested at 28 days and one year.

This paper was answered by Stanton Walker of the Structural Material Research Laboratory, who pointed out some reasons why Mr. Hutchinson's tests might have shown differences from what would be expected from the fineness modulus of the aggregates used. He also showed that some of the mixes tested were "unworkable."

Slag Admitted as Aggregate

The committee E-5 brought in no change in aggregate specifications, but admitted air-cooled slag from iron furnaces among the aggregates. Slag was excepted from the wear test provided for other aggregates. A weight of not less than 70 lb. per cubic foot was specified for slag for ordinary concrete.

A considerable part of the Institute's time was given to the discussion of concrete products and their manufacture. A report of this work will be found in the Cement Products section of this issue.

Some Interesting Experiences in State Ownership and Operation

Politics and Business in South Dakota Do Not Make for Efficient Portland Cement Manufacture

WE have before us a copy of the Special Joint Investigating Committee, of the South Dakota State Legislature, on the state cement plant. There are a good many statements in this report we frankly would not care to repeat in ROCK PRODUCTS, and which undoubtedly are the results of a partisan political angle, of the details of which we are entirely ignorant.

The report is chiefly interesting as so much more proof, added to the mountains of evidence already available, that politics and business do not mix, and that no state-owned enterprise can be operated efficiently or successfully over any great length of time. Just so long as politics are politics the "outs" will proclaim the "ins" scoundrels; and the "ins" will use all their power and influence to prove the "outs" worse than scoundrels. We are all accustomed to inefficiency and extravagance in government, and make the best of it; but inefficiency and extravagance in business is fatal, as every business man knows.

The South Dakota state cement plant, since its inception, has apparently been through three state administrations and what follows are extracts from the history of it in the committee's own words:

History of Cement Legislation

"A brief history of the cement legislation and the activities of the State under such legislation may be of interest and value to the Legislature. The Special Session of the Legislature of 1918 by resolution, found in Chapter 32 of the laws passed at that special session, submitted to the vote of the people, the question of empowering the State to engaged in the manufacture and sale of cement and cement products. This question was voted upon at the general election held in the State in November, 1918, and was carried by a vote of 38,108 in favor of empowering the state to engage in such business to a vote of 25,702 against the project. The amendment to the constitution adopted at that time is found in Article 13, Sections 10 and 11 of the Constitution. These sections are as follows:

Article 13. Section 10. The manufacture, distribution and sale of cement and cement products are hereby declared to be works of public necessity and importance in which the State may engage, and suitable laws may be enacted by the legislature to empower the State to acquire by purchase or appropriation, all lands, easements, rights of way, tracks, structures, equipment, cars, motive power, implements, facilities, instru-

mentalities and material incident or necessary to carry the provisions of this section into effect; provided, however, that no expenditure of money for the purposes enumerated in this section shall be made except upon a vote of two-thirds of the members-elect of each branch of the legislature.

Editor's Note

WE PUBLISH this as one of the frankest confessions of the futility of state ownership and management of a cement plant (or for that matter any similar business enterprise).

These points stand out:

(1) Three changes in management since 1921.

(2) Originally intended to use \$1,000,000 of the public funds.

(3) Over \$2,000,000 now spent and \$275,000 more needed for working capital.

(4) A justified inference that the governing representatives of the sovereign people of the State of South Dakota know little about cement plants.

(5) A frank admission that an attempt was made to join the Portland Cement Association for ulterior motives.

(6) A confession that one motive was to compel other cement manufacturers to cut prices.

(7) A confession of the necessity of requiring by law all state, municipal, school, etc., authorities to use none but state-made cement, notwithstanding the admission that all the cement is now distributed by dealers—and that the dealers are influenced in handling various brands by "prompt shipments and such other service as might be rendered by the various companies."

(8) Not only to compel its citizens to use state-made cement exclusively but to compel them to accept the state's own word as to its quality. Altogether the report, or such part of it as reproduced herewith, is a prize essay on the fruitlessness, unfairness, folly and grief of state-owned business enterprises.—The Editor.

Section 11. The State may pledge such cement plants and all of the accessories thereto and may pledge the credit of the State to provide funds for the purposes enumerated in section 10 of this article, any provisions in this constitution to the contrary notwithstanding.

"The regular legislative session of 1919, by Chapter 324 of the Session Laws of 1919, created a cement commission, consisting of of the Governor and four members appointed by the Governor.

"By this law the Commission was authorized to make a thorough investigation of the feasibility and practicability of the manufacture and sale of cement and cement products by the State of South Dakota, and to purchase the necessary land and construct a cement plant if deemed feasible, and a bond issue of one million dollars was authorized to secure funds for the purpose of leasing, purchasing, constructing and operating a cement plant. By Chapter 277 of the Session laws of 1921 the original law was amended so as to authorize the issuance of a bond issue in the sum of \$2,000,000 in the place of \$1,000,000 for the purpose of leasing, purchasing, constructing, equipping, managing and operating a cement plant. This, in brief, is the legislation on this subject to date.

"The original commission made a thorough and careful survey and test of the cement material of the state and particularly investigated the materials and feasibility of the manufacture of cement at Yankton, Springfield, Mitchell, Chamberlain and Rapid City. Transportation facilities, freight rates, coal and fuel supply were all also studied and investigated. On December 17, 1920, the Cement Commission adopted a resolution to the effect that "the State can successfully and does engage in the manufacture of cement and cement products." On December 30, 1920, the Cement Commission adopted a resolution locating the cement plant in the vicinity of Rapid City, Pennington County, South Dakota, and that "the State engage in the manufacture of cement and cement products at said location and that a suitable site for same be procured." About the same time an option was secured on 550 acres of land in the vicinity of Rapid City at a cost not to exceed \$25,000. This land contained a large amount of limestone suitable and available for the manufacture of cement. This, in brief, ended the activities of the first Cement Commission.

Activities of Second Cement Commission

"After Governor Wm. H. McMaster was inducted into the Governor's office in January, 1921, a new commission was appointed.

"The new Commission allowed the option above mentioned on 550 acres to lapse and finally purchased 187 acres a couple of miles west and a little north of Rapid City, for the sum of \$24,000, and a 40-acre tract of land about five miles east of Rapid City for the sum of \$8,000. The 187-acre tract is now the site of the South Dakota cement plant and also the limestone quarry from which the limestone is secured in the manufacture of cement. According to the evidence before the committee, there is, however, only about four or five acres of this land which contains limestone suitable and available for the manufacture of cement. The 40 acres of land east of Rapid City is shale land, and it is from the land that the shale used in the manufacture of cement is secured.

"According to the minutes of the Commission, the engineers submitted their estimates of the cost of the construction of the plant on or before February 19, 1923, and that on said date the Commission had a meeting at Pierre and approved the plans submitted for the construction of the plant, the cost of which was estimated to be \$1,403,089, exclusive of the cost of furniture and equipment for the proposed office building and laboratory, and the cost of mechanic's tools for the shops, estimated at \$9,927.

Buildings Constructed

"Sometime in February, 1923, the Cement Commission began letting contracts for machinery, materials and buildings, and your committee finds the following structures erected by the Cement Commission in connection with the cement plant:

"Office, laboratory and locker room building, the dimension of which is 68x80 ft. and one story in height. This building is built of concrete foundation, concrete brick side walls and tile roof. The floors are of concrete covered with battleship linoleum in the office and laboratory space. This building, beside the office rooms, contains physical and chemical laboratories and chief chemist's office, employees' locker room, including steel lockers and shower baths for the use of the employees. This building has an independent heating plant.

"A raw material storage building 80x408 ft. This building is built of concrete foundation extending up from the surface of the ground 5 or 6 ft. On top of that is a steel super-structure, covered on the outside with galvanized corrugated steel and has a reinforced concrete roof. This building has an overhead electric traveling crane, used in the handling of the raw material such as crushed limestone and shale and also coal, and the raw material is transported from this building to the mill proper by a belt conveyor. A railroad track passes through this building and coal and rock cars can

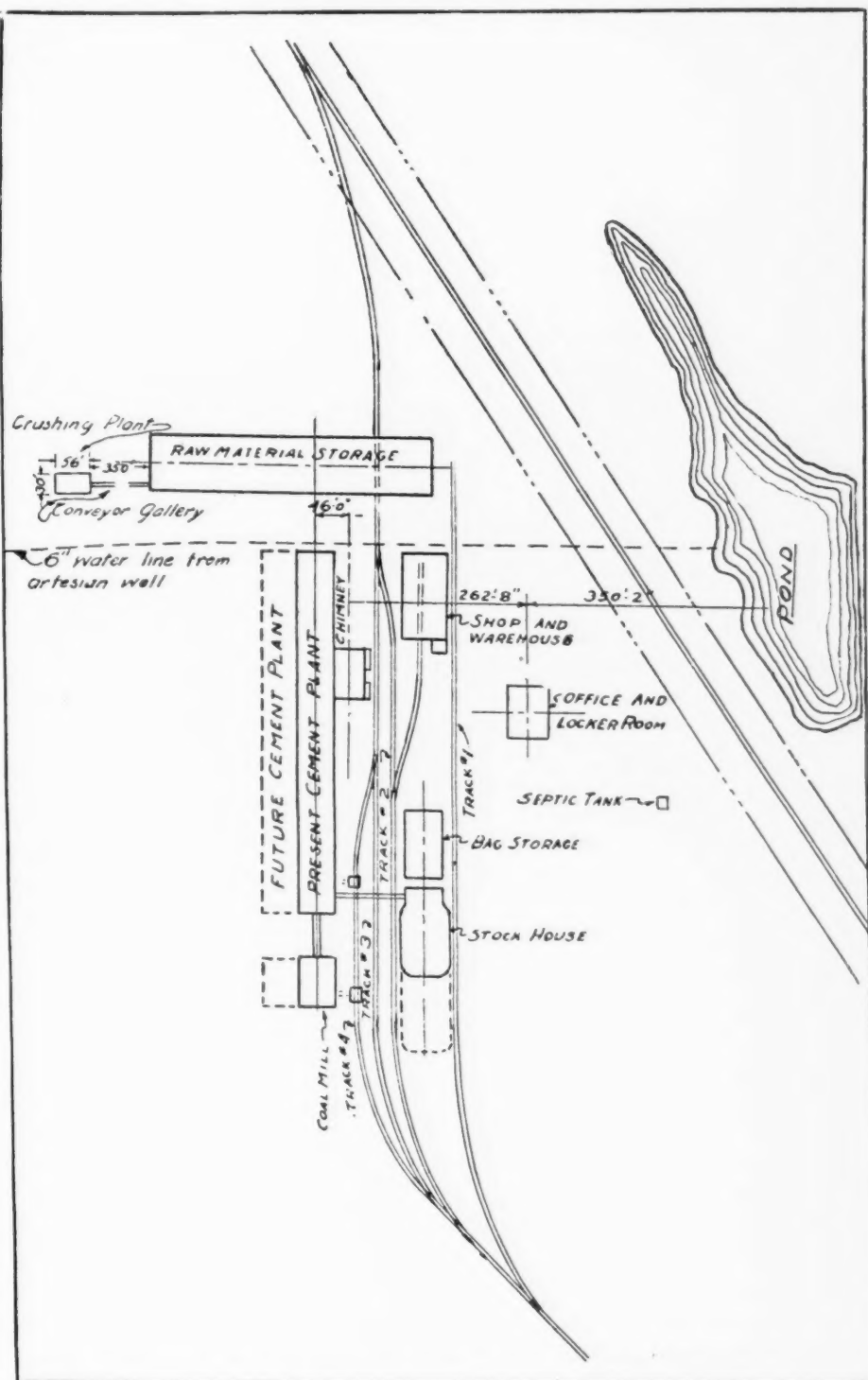
be run into the building and there unloaded by the electric crane.

"Main mill building, 50x512 ft., with an addition on the east side housing the power station, 42x48 ft. This building is built in the same way as the raw storage building except that the addition containing the power station is of reinforced concrete foundation and concrete brick side walls and composition roof. In this building are located the raw grinding mills, six large tanks called slurry tanks to hold the raw material after it is ground and mixed with water, waste heat boiler, two cement kilns, 10 ft in diameter by 150 ft. long, steel bins for pulverized coal, gypsum bins, cooler kilns, grind-

ing machine to grind the finished cement, together with electric motors to furnish the power. The power station contains the machinery necessary to operate the plant. The power is furnished by two steam turbines and is transmitted in the form of electric current throughout the plant.

"Coal mill building, 50x72 ft., is constructed in the same manner as the raw material storage building. This building contains the coal drying and pulverizing equipment.

"Stock and packing house, 67x120 ft. This is of reinforced concrete, including the roof, and is supposed to have a capacity of 100,000 bbl. of finished cement. The cement is stored



General layout of new state-owned South Dakota cement plant at Rapid City

in six circular structures, 32 ft. in diameter and 72 ft. high and in addition to that there is a packing building where the cement is sacked.

"Bag house, 54x99 ft., is built of reinforced concrete, including roof, and is a one-story building with full basement. This building is designed for the storage, repair and cleaning of cement bags.

"Oil house and employees' lunch room, 30x34 ft., and is of reinforced concrete foundation, concrete brick walls and asbestos shingled roof. In this building oils and greases are stored and there is an employees' washroom, toilet and lunch room.

"Crusher building, 30x56 ft., is constructed of reinforced concrete foundation with steel superstructure and corrugated galvanized steel sides and roof. In this building is located the crushers that crush the limestone rock, and your committee found one gyratory primary crusher and one swing hammer pulverizer for secondary crushing. The crushed limestone is conveyed from this building to the raw storage building by a belt conveyor. The crusher building is located 350 ft from the raw storage building.

"Shop and warehouse building, 67x122 ft., has a reinforced concrete foundation, concrete brick side walls and reinforced concrete roof. This building is equipped with a large assortment of repair machinery some of which was purchased by the Commission, some of which was secured from the surplus war material of the Government. This building is fully equipped to make any necessary repairs that may be required.

"At the quarry there is another building 28x62 ft., built of reinforced concrete foundations with concrete brick side-walls and tile roof. This building is designed to house narrow-gage quarry locomotives, a blacksmith shop and an air compressor.

"At the shale pit site there is another building constructed of concrete, sheet iron and steel sides and roof. This building is 17 ft. 6 in. by 66 ft. 6 in. with an addition 16 ft. 6 in.x20 ft. This building was designed to contain machinery for crushing or disintegrating the shale before the shale was taken to the plant

"Water cooling system; in addition to the foregoing buildings, the Committee found near the buildings a pond equipped with a water cooling system and at this pond there was a small brick building.

Process of Cement Manufacture

"The shale is brought to the plant by means of freight cars operating on a branch line of the Northwestern Railroad passing directly through the raw storage building. This road also serves to convey all coal and other supplies needed by the plant. Both coal and shale supplies are unloaded by means of a large traveling crane.

"At the further end of the raw storage building a belt conveyor brings the ground limestone from the rock crusher and dumps it into piles from which it may be removed

at will by the traveling crane.

"When placed into operation the limestone and shale, in the amounts needed, are picked up by the traveling crane and dropped onto a conveyor which carries them to the raw crushers located in the mill building.

"Passing from the clinker storage by means of the same bucket conveyor apparatus which brought it out the clinker goes to the finished grinders. The gypsum is added by special apparatus during this operation. The finished cement is carried by conveyors to the large storage house located adjacent to the mill building. This consists of eight large concrete bins with an approximate storage capacity of 100,000 bbl. of cement.

"Located at the opposite side of the mill building from that of the raw storage is the powdered coal apparatus and coal dryer. The coal is brought to the crusher from the raw storage building or directly from the mines and dumped into a pit under the track. It is then elevated up to the crushers and sent to the dryer. This dryer passes the powdered coal by means of compressed air over heated kilns and the moisture is driven off in the form of vapor.

"Passing from the dryers the powdered coal in intimate mixture with compressed air goes to the burners in the cement burning kilns as previously mentioned. The heated gasses pass from the lower mouth of the kilns over the slurry and thence to the waste heat boilers. The residual heat left in the gasses is then used to generate steam for the driving of the electric machinery which in turn generates power for the turning of the crushers, kilns, dryers and other power operations. The finished cement may be stored in the concrete bins or silos into which it has been put after grinding indefinitely. When shipments are ordered it is then removed and passed through a packing machine and then sent to the consumer.

"The limestone is quarried near the plant and after being removed by blasting and steam-shovel operations is placed upon cars and sent to the crusher located immediately above the raw storage building. After passing through the crushing plant it goes, by means of a belt conveyor, to the raw storage building.

"The shale is brought from the shale quarry by steam train and goes directly to the raw storage building. When necessary the shale is preground at the shale pit before shipment to the storage building.

"The waste heat boilers are used in conjunction with an auxiliary boiler plant located adjacent to the mill building and connected thereto. This boiler serves to generate power for starting the mill and until the waste-heat boilers may be brought into action. It also furnishes additional power when needed. The steam generated in both sets of boilers passes to the large horizontal turbines located in the generating room immediately attached to the boiler room and serves to drive large electric generators. The generator room contains two large switch

meter boards, for the purpose of controlling the various feeders to the several portions of the plant and for metering and measuring the energy consumed. Additional meters and pyrometers are also installed here to indicate the temperatures of the kilns and various passes for hot gasses, and other operations. Below the generating room is a basement where are located various feed pumps, heaters, condensers and water softeners.

"Adequate switch trackage is located in and around the plant site to facilitate the multitude of carrying operations.

Receipts of Commission

"Your Committee finds that the total amount of money that has come into the hands of the Cement Commission up to January 7, 1925, from bond sales, general appropriation, interest from banks and money received from contractors on adjustments amounts to \$2,095,933.19.

Expenditures

"The expenditures of the Commission to January 7, 1925, amount to \$2,040,078.05 as follows:

| | |
|--|----------------|
| Paid on contracts let on bids for construction of buildings..... | \$ 702,677.90 |
| Paid on machinery contracts let on bids | 698,107.39 |
| Engineering fees | 86,639.66 |
| Paid for 40,000 cloth cement bags and 100,000 paper cement bags..... | 75,951.49 |
| Paid for furniture and fixtures..... | 5,318.90 |
| Paid for interest, office expense and expense and salaries of the Commission | 97,686.14 |
| Paid for real estate..... | 32,000.00 |
| Miscellaneous | 341,696.57 |
| Total | \$2,040,078.05 |

"This left a balance on hand on January 7, 1925, of \$55,855.14. Of this balance \$8,070.25 is tied up in closed banks as follows:

| | |
|--|------------|
| Security Savings Bank, Rapid City, S. D..... | \$5,796.12 |
| Citizens Bank & Trust Co., Rapid City, S. D..... | 2,264.13 |

"Since the date when the above balance was taken such balance has been spent and there is now nothing in the cement plant treasury.

Cost of Plant

"While it is somewhat difficult to determine the exact cost of the construction of the plant owing to the interlocking character of the various funds and the difficulty of properly allotting to the various activities the proper amounts, your Committee finds that the plant cost approximately the sum of \$1,817,075.05 and we have included the following items, to-wit:

| | |
|------------------------------------|-------------|
| Office salary | \$15,827.56 |
| Office rent, light, etc. | 4,370.65 |
| Office rent and fixtures..... | 2,432.81 |
| Office stationery and postage..... | 1,956.79 |
| Bond issue and expense..... | 4,233.76 |
| General expense of Commission..... | 13,642.31 |
| Former Commission expense..... | 1,768.88 |

"Defects and Irregularities"

UNDER the above heading the committee lists a number of alleged shortcomings in the new plant. Without knowledge of the plant or circumstances, of course, one can not say how much foundation there is

for this fault finding. A reading of the report by an unbiased person familiar with the portland cement industry leads to the conclusion that much capital is made of those imperfections which are inherent in assembling any \$2,000,000 plant. Quite naturally there are many things at every new plant which keep it from starting off like a new Ford car. But cement plants are not Fords, and we judge the investigators are more familiar with Fords than with cement plants.

As to alleged irregularities, the less said here the better. However, the fact that such charges are made is further proof of the folly of attempting such a business enterprise with a constantly changing political machine as management. We quote from the report again as follows:

"Your Committee feels that the Commission is subject to just criticism for spending nearly all the money on construction and equipment and without making any provision for an adequate operating fund. There is at the present time no money in the treasury of the Commission with which to operate or make any repairs, in fact the Commission and the plant is in debt and has no funds with which to pay outstanding bills or with which to pay operating expenses and unless an immediate appropriation is made the plant will be compelled to shut down.

Sales Policy

"In conducting this investigation important data was gathered from such diverse and competent authority that your Committee feels that it would be remiss if it did not set forth its findings that they might be utilized in forming a "Sales Policy."

"On June 1, 1924, the Commission determined to prepare for the distribution of the product of the state cement plant and as an initiatory step hired a sales manager. A sales policy was formulated and presented to the Commission by the sales manager identical to that used by the Portland Cement Association or so-called "cement trust." This policy was adopted by the Commission and in the fall of 1924 the sales manager was instructed to meet with the Portland Cement Association at Chicago and to make application for membership in said Association and to secure the "cost accounting system" used by them.

"He went to Chicago and learned that the Association was not in sympathy with state-owned cement plants and would not admit them to membership, nor permit them to secure their cost accounting system. The sales policy was not changed, however, and in furtherance thereof a road salesman was hired who started to work December 1, calling on the trade and acquainting them with the policies of the plant. No orders were taken.

"The State of South Dakota in the year 1919 used 700,000 bbl. of cement. In 1923 585,000 bbl. were used, so that an average of 600,000 bbl. is about the normal consumption. Of this amount 70% was used in that part

of the State of South Dakota lying east of the Milwaukee Line through Mitchell; 30% in the remainder of the State; about 55% of the total amount of cement used for the state is used on farms. The remainder is used in cities, roads, bridges, culverts, etc.

"The distribution of this cement is accomplished through dealer agencies, practically none being sold outside of the regular dealer who is the lumber yard, elevator, coal dealer, and building and building material dealer. There are 650 dealers in South Dakota, most of them lumber yards. Of these 21 are farmer co-operative organizations, 109 are independent yards, and the remainder are owned in groups of three or four up to forty.

"All testimony taken was in accord in stating that cement was not purchased on a basis of quality since a standard acceptable to all is maintained by all companies, and that the determination of the factory from which each dealer purchased cement was governed by personal predilections, prompt shipments and such other service as might be rendered by the various companies.

"When the building of the cement plant was authorized by the State Legislature it was generally understood that the policy of the Commission would be to manufacture a thoroughly high grade cement and to offer it for sale at a price which would not be based on a profit-making scale, but rather on a price which would include only the cost and a sufficient plussage to cover the cost of operating, deterioration, repairs and interest on the investment. It is to be expected that the other cement manufacturers will meet the price of the State product, and in this event the saving to the State will not be measured only by the reduction in price of the state product but by similar reduction on all cement sold in the state, and your committee feels that a reduction in the price of cement should be made as soon as the cost of its manufacture is determined and in so doing will keep the promise made to the State when the bonds were voted.

Operation of Plant

"The plant began manufacturing cement some time the latter part of December, 1924 and at first only one kiln was operated but the plant is now operating at full capacity, and has been doing so for the last ten days. With the exception of the difficulties pointed out in this report the plant seems to be operating efficiently and smoothly. It is turning out a high grade of cement at the rate of from 1,700 to 2,000 bbl. of cement every 24 hours.

"There is on hand approximately 50,000 bbl. of manufactured cement ready to put on the market. This is in addition to the 15,000 bbl. that was first made and which was not suitable for the market.

"The latest reports coming to the Committee from the plant is to the effect that numerous inquiries are beginning to come in from prospective buyers concerning prices and terms on State cement and that orders are coming in unsolicited for carload lots.

Conclusions and Recommendations

"(a) We believe that the plant is admirably located with reference to proximity to an abundance of the finest raw materials suitable for the manufacture of a high grade of cement. And that because of the ease of securing the raw materials and the accessibility of the same to the plant that the cement may be produced at a reasonable cost assuming efficient management.

"(b) We further are of the opinion that the success of this plant will further the economic development of the State's resources and will be of material advantage in its growth, especially with regard to the development of the roads and public works.

"(c) We believe that the plant itself though its cost is considerably more than originally anticipated is generally speaking substantially constructed, well equipped and capable of functioning successfully. However, we must call attention to the fact that they are grave structural defects in the finished storage bins, the floor of the work house, and other defects which have been set forth herein.

"(d) While no opportunity has been given to determine under actual construction conditions, laboratory tests prove that the quality of the cement manufactured at the plant is very high and exceeds the standards set forth by the Bureau of Standards for this class of material.

"(e) We are of the opinion that the machinery and equipment is of a suitable type and of modern design, with the exception of the coal dryer, gypsum feeder, hammer mill, and other portions heretofore mentioned in detail. These defects are being corrected as rapidly as possible under the existing circumstances and decrease the economy of the plant operations rather than effect the quality of the finished product.

"(g) We recommend that this Legislature require that in all State, County, Township, Municipal, School, and other public works, wherein cement is used, that the cement be obtained from the State cement plant. And that such certification be issued at the time of shipment as to render further tests to determine the quality of the cement unnecessary.

"(k) We recommend the operation of the plant by the state and to that end an immediate appropriation of a sum of money to provide for the operation of the plant, and for such other purposes as set forth above, and feel that an amount in the sum of \$275,000 is necessary and adequate."

| | |
|---|-----------|
| 1. Requested appropriation | \$275,000 |
| 2. Operation cost pending period of return from finished product covering: Cost of coal for burning cement, electric power, quarrying raw material, expendible supplies and repairs, labor and supervision office expenses and supplies | 135,000 |
| 3. Repair parts | |
| Note. Because of large cost attendant cooling of kilns, due to intermittent shutdown, adequate repair supplies are imperative | 40,000 |
| 4. Estimated bag and other perishable equipment | 75,000 |
| 5. Operation surplus to cover incidentals and emergencies | 25,000 |
| 6. Total | \$275,000 |

Standard and Pacific Coast Gypsum Companies May Combine

CONSIDERABLE interest is being shown in Tacoma, Wash., according to the *News-Tribune* of that city, in the merging of the Standard Gypsum Co., with the Pacific Coast Gypsum Co. of Tacoma. The combination seems to be caused by the fact that the latter company's gypsum mine in Alaska has become filled with water and abandoned. The Standard Gypsum Co. has a mine in Nevada and has organized to operate three plants, one on Puget sound, one on San Francisco bay and one in southern California.

The Tacoma company is now using gypsum from the Nevada mine and the two companies are planning to consolidate and send their gypsum by rail to San Francisco bay, thence by water to the plant at Tacoma.

The moving of the Tacoma plant to Seattle, Wash., is being considered because of the bigger market in that city and for the purpose of getting a site with a waterfront of at least 300 ft. Tacoma business circles are trying to prevent this change of location.

Later news dispatches indicate that the Standard Gypsum Co. has absorbed the Pacific Gypsum Co., and that a site has been purchased at Seattle from the Puget Sound Bridge and Dredging Co. on which a new plant will be built at a cost of approximately \$300,000.

Seattle men who will be identified with the company under the new arrangement are: Joshua Green, John W. Eddy and John R. Holmes.

United States Gypsum Company Holds Prize Competition for Fireproof Home

ARCHITECTS, draftsmen and architectural students throughout the country are invited to participate in a competition in designing fireproof small homes with exterior walls of structolite gypsum concrete, which is being conducted by the Architectural Forum of New York City and the United States Gypsum Co. of Chicago. The contest is approved by the American Institute of Architects and will close April 15. The cost must not exceed 50 cents per cubic foot.

Prizes of \$500, \$300, \$200 and \$100 will be awarded by a jury of leading architects to the winning designs in each of two classes, and ten honorable mentions in each class will receive \$50 apiece. Class A is for five-room bungalows and class B for six-room two-story houses.

Purposes of the competition are:

"1—To encourage further a higher standard of design and plan of the average American home which, because of its moderate cost, is often built without the benefit of competent individual architectural service.

"2—To introduce widely a new form of fire-resisting, permanent and economical construction through the use of structolite concrete construction. This is an improved method of fire-resistive construction for walls, floors, partitions and roofs, adaptable for all classes of buildings. Structolite concrete is a mixture of structolite, a form of gypsum possessing great structural strength, with various recommended aggregates to form a rapidly setting mix for pouring monolithic construction."

Chemical Equipment Exposition Will Be Held in Providence

THE Chemical Equipment Exposition will be held in Providence, R. I., June 22-27 inclusive, 1925. The Exposition is endorsed by several technical organizations and will be attended by a thousand technical men and executives. Among the companies supporting the exposition are: Raymond Bros. Impact Pulverizer Co.; The Bristol Co.; General Electric Co.; and the U. S. Rubber Co. The National Lime Association and some individual lime manufacturers will have exhibits.

The exposition will be held in the State Armory and general headquarters of the association are 1328 Broadway, New York. Arthur D. Little, president of Arthur D. Little, Inc., of Boston, Mass., was recently elected chairman of the Chemical Exposition Committee to succeed Charles H. Herty.

Texas Gypsum Deposit to be Developed

DEVELOPMENT of the gypsum deposit near Sierra Blanca, Texas has been started by the Southwestern Chemical Co., of Houston. The deposit has been explored and covers a large area and a plant will be erected to produce gypsum products, a dispatch of the *Los Angeles (Calif.) Times* states.

Gypsum Plant at Plaster City, Calif., Growing Rapidly

WHAT was once a small gypsum crushing plant at Plaster City, Calif., has, since being purchased by the Pacific Portland Cement Co., Consolidated, grown into a modern gypsum plant, where fertilizer, cement retarder, hard-wall and finish building plasters, casting, molding and dental plasters are manufactured. According to reports the company is now installing machinery for the manufacture of gypsum tile.

At present all the buildings at the plant are of wood and galvanized sheeting, but it is planned to replace the mill and other main units soon with steel and reinforced concrete structures. The plant thus far represents an investment of about \$1,000,000 and has a capacity of 300 tons per day.

G. G. Watson is general superintendent in charge of operations.

Soils Testing Car to Visit Pennsylvania Towns

A TRAVELING soils testing car, operated by the New York Central Lines, Agricultural Relations Dept., will make a two weeks tour beginning March 14, visiting many Pennsylvania towns among which are Knoxville, Wellsboro, Clearfield, Jamestown, Warren and Youngsville.

Experts from the state college and the state department of agriculture will test all samples of soils submitted by the farmers at the various points for acidity, nitrogen and phosphorus, and make whatever recommendations are necessary, as to how much lime or fertilizer should be given each soil. All tests and sufficient lime to treat an acre and clover seed to plant it will be given to the farmers submitting soil samples.

Oregon Railroad Bridge to Be Rebuilt to Permit Cement Plant to Run

THE plant of the Beaver Portland Cement Co., at Gold Hill, Ore., is still idle as a result of the bridge across the Rouge river at Grants Pass, Ore. being washed out last December. The California and Oregon Coast R. R. discontinued traffic on 14½ miles of railroad after the washout and failed to build a new trestle across the river thus separating the cement plant from its quarry at Marble mountain, according to the *Spokane, Wash. Spokesman Review*.

A hearing was held before the public service commission at Grants Pass last month. C. H. DeMaray has been appointed receiver of the railroad company, following the company's refusal to build the bridge, and will present plans for its financing.

The Coal Situation

"NOTWITHSTANDING the fact that the fundamental conditions of our country and business, in general, are good, the problem facing the coal industry is a great one," says John H. Jones, president of the Bertha-Consumers Co., in the company's coal bulletin. "The buying power of the farmer and laborer is better now than it has been for some time. Nevertheless, the coal industry is in a rather chaotic condition."

Mr. Jones goes on to show that from present indications more coal will be mined this year than any previous year but that due to over-development of mines, the supply is greater than the demand, so that the price at which coal is now being sold is less than the average cost of production. At present some mines are operating full time, other plants have been idle for over a year. Some operators have leased their mines to others who are operating them at less than the union wage scale. He advocates that buyers, producers and miners indulge in a lot of thinking, before it is too late, toward stabilizing the coal industry and thus preventing a general upset in all business.

Editorial Comment

It is to be hoped President Coolidge's words of wisdom on government ownership will not fall upon deaf ears. Just at this moment the rock products industries are getting a stomach full of government ownership. Let us hope the President's advice and the experience of South Dakota will have a restraining influence upon the zeal of politicians in many states in agitating for government-owned cement and aggregate plants.

Government Ownership

A good deal of space in this issue of ROCK PRODUCTS is devoted to the subject of rock-dusting coal mines. It is believed that producers of pulverized limestone, particularly, are interested in this new development; and if they wish to take full advantage of the new market possibilities thus introduced, there is need for them to know as much as possible of how, when and where rock dust for coal mines is used.

Rock Dust for Coal Mines

We have attempted to do a little estimating of the importance of this field as a market for limestone dust, assuming that eventually all important coal mines will use limestone dust for reasons of economy as well as of hygiene.

At present 42 mines have adopted rock dusting. These 42 mines have 500 miles of passages, or workings, that are dusted. An average of 4 lb. of rock dust per foot of passage, or entry, is used. In round figures 5000 tons of rock dust are required. The dusting is done at least twice a year. This accounts for a rock dust consumption of 10,000 tons per year. Assuming that there are 2000 mines of the size of the average of the 42 described, and that the mileage of workings is in the same proportion, the total mileage of mines that should be dusted is 25,000; and the annual requirement of limestone dust to dust them will be 500,000 tons. In addition to this amount, dust is required for barriers—say 2000 lb. per barrier—and say three barriers are required per mile of passage. This figures only 75,000 tons. Of course, the dust used in the barriers is more or less permanent and would not have to be replaced except at long intervals.

In other words, the total annual requirement of all the coal mines in the country for rock dusting would not exceed the present consumption of agricultural limestone in the single state of Illinois. However, the consumption of pulverized limestone, for dusting coal mines, if rock dusting is universally adopted, would probably considerably exceed the present annual consumption of finely pulverized stone for all such uses as asphalt filler, paint filler and other industrial uses. In other words, it looks like a business worth fighting for by limestone producers making a 200-mesh product.

At the recent convention of the Concrete Institute there was given a demonstration of the design of a concrete mixture for concrete products. Even the most enthusiastic proponent of scientific concrete must admit that it was a long and tedious process. It involved:

Concrete by Weight

(1) Finding the fineness modulus of the sand, (2) Finding the fineness modulus of the gravel, (3) Calculating the percentage of sand necessary to make an aggregate with the required fineness modulus, (4) Determining the unit weight of the sand dry, (5) Determining the unit weight of the sand loose and moist, (6) Determining the unit weight of the gravel dry, (7) Determining the unit weight of the gravel loose and moist, (8) Determining the unit weight of the mixed aggregate dry, (9) Calculating the cubic feet of mixed aggregate, (10) Calculating the cubic feet of each aggregate separately, dry, (11) Converting the cubic feet dry to the cubic feet in a damp loose condition.

Analysis of the process shows that all the steps beyond the first three are merely to change the weights of aggregates to volumes and thus permit mixing by measuring the aggregate in cubic feet instead of weighing it in pounds. This not only means a lot of work but it offers a considerable opportunity for error. Why, then, is it not better to make the rule for making scientific concrete as simple as this? Calculate the fineness modulus for the sand and for the gravel. Figure the percentage of sand necessary for the mix and weigh out the required quantities with an allowance for moisture in the sand and gravel.

Iowa and Florida highway commissions have adopted the mixing of concrete by weight and the method has been used on important structures. Aggregates are being generally sold by weight, and where producers have to put in batchers they could put in batchers that weigh the aggregate as easily as they could put in those that measure it. The moisture determination can be made in a minute, with sufficient accuracy, if it is necessary to make it at all. A percentage figure of allowance ought to be accurate enough for most cases. It may be too inconvenient for the man who wants to put in a few yards of concrete to weigh the aggregates, but this does not apply to the makers of concrete products, those who run central mixing plants and the contractors with large outside jobs.

Manufacturers of gypsum plaster and other gypsum products used to make these by measurement and estimate, but they long ago adopted the weighing of the materials that go into their products as necessary to secure uniformity. It is the old story of science replacing "rule of thumb" methods.

Lehigh Buys New Bath Portland Cement Plant

THE Lehigh Portland Cement Co. recently bought the new cement plant of the Bath Portland Cement Co., which is being constructed at Sandt's Eddy on the Delaware river according to a news dispatch in the *Philadelphia (Penn.) Inquirer*.

The home plant of the Bath Portland Cement Co., at Bath, Penn., was also leased by the Lehigh Portland Cement Co. Each plant has a capacity of 1,000,000 bbls. a year. The plant at Sandt's Eddy will be completed by fall.

New Michigan Cement Plant

THE Michigan Alkali Co., Detroit, Mich., has begun the construction of a new wet-process Portland cement plant at Wyandotte, Mich., to be operated by the Wyandotte Portland Cement Co. The F. L. Smith Co., New York City, and the Burrell Engineering and Construction Co., Chicago, are the contracting engineers. The plant will be ultra-modern in every sense of the word and will eventually take the place of the present Wyandotte plant, which has small kilns using both wet and dry process.

Large Cement Order Goes to Dewey and Kansas Cement Companies

AN order for 130,000 bbl. of cement at \$2.47 per bbl. for the construction of a new plant in Kansas City, Mo., by Sears-Roebuck Co. has been awarded to the Welch Sandler Cement Co., dealers, at Kansas City. The order was given to the Dewey Portland Cement Co., at Dewey, Okla., for 75,000 bbl. and to the Kansas Portland Cement Co., at Bonner Springs, Kan., for 55,000 bbl.

The Dewey company will begin shipments immediately, according to local news dispatches, and complete its order by September 1.

Cement Company Has Perfect Safety Record for January

WITH 200 men employed at the plant of the Superior Portland Cement Co. at Concrete, Wash., not a single hour's time was lost on account of accident during January. The remarkable record was announced at the Seattle offices of the concern.

January is considered the most hazardous month of the year because of bad weather conditions and the fact that during that month most of the machinery and equipment is overhauled and repaired. Despite these conditions the safety committee was able to make the 100% record and will strive to hold it throughout the year.

The company also is giving instruction in first aid, although it is the aim to avoid all accidents.—*Seattle (Wash.) Times*.

How to Increase the Present Low Price of Cement

NOTWITHSTANDING indisputable proof that the price of Portland cement has risen during the last few years much less than that of any other basic building material, and notwithstanding impartial and expert testimony that the profits in the manufacture of portland cement are no more than, nor even as much as, profits in many other lines of manufacturing requiring less risk and smaller investments, notwithstanding all these irrefutable facts and many more, politicians still take delight in attacking the alleged "cement trust."

Certainly no industry can operate to the utmost efficiency while it is being continually badgered by politicians. It costs real money to defend the industry against such attacks both in the courts and elsewhere. Does it ever occur to the people these politicians would help that it is themselves who eventually pay the bill? The money to defend the cement industry must come out of the cement industry.

The portland cement industry has made remarkable progress in efficiency and toward cheapening costs of operation; otherwise the price of cement would have risen in proportion to the price of all other manufactured commodities. But the cement industry can not keep down "overhead" costs if it is continually harassed by such men as Governor Silzer of New Jersey, who addressed the Association of State Highway officials at Atlantic City, February 28, as follows:

"We require more roads, better roads, wider roads, substantial bridges and the abolition of grade crossings, and it is of the utmost importance that roads be well and honestly built."

After saying that the basis of most roads is cement, he urged the six states represented to join in getting the federal government to "prosecute the combine of cement companies." Otherwise, he said, the states should establish their own cement plants.

The governor continued: "You all know there is no competition in the cost of cement. A dozen agents will come to you on one day and their prices will not vary."

"There must be something wrong about this. Perhaps we can go back to the trial in New York state when the government indicted a number of cement companies for conspiracy to fix the price of cement. There was a disagreement in that case and it was never retried. And since that time the condition in New Jersey, at least, has been the same as it was before the trial."

"If we could get some co-operation from the federal government in the way of investigation and prosecution, this trouble should be quickly ended."

"My thought is that New Jersey as a state might enter into the cement business. Certainly the states represented here could get together and operate such a cement

plant, or they might establish such a plant and jointly buy from it."

We respectively refer Governor Suzer to the report of the South Dakota State Legislature's investigating committee, abstracted elsewhere in this issue.

Local Supply Man Answers Governor Silzer

GOVERNOR SILZER'S attack on the "cement trust" in his address to the highway engineers' convention, claiming that the elimination of competition brought in its trail higher prices, thereby making it more expensive to road building programs, interested local supply men. They, however, were not ready to agree with the governor either on the question of excessive prices nor did they believe in a state owned cement plant or could they see how two or more states could jointly obtain supplies in the open market.

"Through being in personal touch with cement manufacturers I may say that none of them, at the present tariff, which has been stabilized at the same level for three years, are earning what you may call profiteering prices," said Daniel Murtland, of the John Murtland firm, one of the largest supply houses in Atlantic City, is reported to have said.

"Some of them are still carrying debts which were incurred before the advance in cement took place and none of them, so far as I am aware, are declaring big dividends."

"There is a differential allowed from manufacturer to dealer of ten cents a barrel and from dealer to consumer of ten cents a barrel. That is small. The price of cement today is \$2.55, with a rebate of 40 cents for bags returned in small lots. Then there is allowed a discount of 15% upon quantity purchases."

"As to the governor's thought that two or more states join in making cement contracts there is no single plant that could undertake them and there would have to be group bidding through one firm."

"It is not reasonable to believe that any plant would tie up its entire output for a state contract at the expense of its regular patronage. At the expiration of the state contract it may not get a renewal and it would have to rebuild its patronage, a slow and arduous task. I do not think that the proposal is practical."

"With relation to a state owned plant, I do not think it could make cement of the same grade as is now demanded by road engineers as cheaply as private concerns. The upkeep of a cement plant is tremendous. There is no industry which is harder on machinery."

"I think it should be pointed out that the increase in price of cement since before the war has been proportionately much less than for other building materials. Lumber and steel are much higher. So far as my knowledge and judgment are concerned, cement prices are reasonable and fair."

Blue Diamond Mortar Plant for Denver

A SITE for the erection of a plant to cost \$50,000 to manufacture mortar and plaster, under a process owned and patented by the company has been purchased in Denver, Colo., by the Blue Diamond Co., of Los Angeles, Calif.

Negotiations have also been completed by K. M. Grier representing the company, according to a local newspaper, for the output of the High Grade Sand and Gravel Co. of Denver and for a portion of the output of the Colorado Lime Corporation, with deposits at Calcite, Colo.

General Manager Spaulding of Los Angeles is expected to take over the management of the new plant. W. C. Hay of Los Angeles is president of the company.

Harleston Gravel Co. Expands

THE Harleston Gravel Co., with headquarters at Greenwood, and works at Avalon, Miss., is putting in a new washing plant which is calculated to have a capacity of 1,000 yards daily, according to the *Hattiesburg (Miss.) American*.

Ashleigh Harleston, president of the company, is reported to have offered to purchase a 1,400 acre tract at Avalon for \$165,000.

The business of the company exceeded anticipation last year and the output exceeded a million tons for 1924 and contracts on hand for this year equaling last year's production.

J. H. Hobson, formerly general manager of the Louisiana Stone and Gravel Co., is in charge of the construction of the new plant and will be the superintendent. R. I. Miller, formerly with the S. K. Jones Construction Co., and C. R. Pate, formerly associated with the Batesville Gravel and Material Co., have been added to the personnel of the company.

Nebraska Gravel Company Files Complaint Against Railroad

THE firm of Glatfelter and Powell of Central City, Neb., who have sand and gravel pits a short distance from that city and one near Newark, Neb., filed a complaint with the state railway commission against the Burlington railroad claiming that they are being discriminated against by several rules of the road, according to a local paper. They complain about a rule that results in rates being figured from Central City in the case of one pit and Kearney in the other, this being that where rates are not provided for exact distances the rate for the next greater distance shall be used. They say this adds half a cent a hundred to freight charges. They also complain that favoritism is being used in handling traffic from spur tracks.

New Laboratory for Security Cement Plant

THE new laboratory at the Security, Md., plant of the Security Cement and Lime Co., was recently completed and is now in use. The building, which is a concrete block and steel structure, cost approximately \$50,000 and is located along the tracks of the Western Maryland railway.—*Hagerstown (Md.) Mail*.

Cincinnati Concrete Products Makers Plan United Buying

A COMPANY, to be known as the Norwood Purchasing Co., was formed at a meeting of the Cincinnati Concrete Produce Association recently.

The company will purchase all cement, gravel and other supplies for members of the association. Formation of the company is aimed to enable the producers to get supplies at a lower price.

The company will have an office with Sidney Crew, association president, at 2120 Madison avenue, Norwood, Ohio.—*Cincinnati (Ohio) Post*.

Conveyor Belts at Basalt Rock Co.'s Plant Cut by Miscreant

SOME person either from malicious intent or mental disorder entered the plant of the Basalt Rock Co., near Napa, Calif., recently, according to the *Vallejo (Calif.) Chronicle*, and cut the two conveyor belts which carry the rock to the storage dumps at the mouth of the tunnel. These belts are about 800 ft. long and 30 in. wide and the damage done caused the plant to be closed for a time, inflicting considerable loss to the company.

Sand and Gravel Producers Will Add Mixed Concrete and Asphalt Plant

A NEW sand and gravel and concrete and asphalt mixing plant is about to be established in Ft. Smith, Ark., by Joe T. Nelson and associates. The project will involve the initial investment of \$100,000 according to the *Ft. Smith (Ark.) Record*.

A site for the central mixing plant has been leased and a franchise has been granted by the city for a railroad from the site to an existing railroad running to sand and gravel beds on a farm owned by C. P. Wilson. The plant will also be connected with the Missouri Pacific Ry.

A survey of the property has been made and immediate plans for the mixing plant and storage room for 1,000,000 yds. of sand and gravel are completed. Machinery and equipment orders are being held up for the present awaiting the settlement of a hearing of complaint filed by a property owner near the site of the proposed plant.

The company expects to add concrete block and roofing tile plants later.

New Egyptian Portland Cement Company Re-elects Officers

AT the annual meeting of the stockholders of the New Egyptian Portland Cement Co., at Detroit, Mich., recently, the following directors were re-elected for 1925; C. C. Peck and M. D. Smith of Port Huron, Mich.; R. D. Baker, Chas. A. Bray and E. R. Sullivan of Detroit; L. A. Holmes of St. Clair, Mich.; S. W. Traylor of Allentown, Penn.

The board of directors re-elected Maynard D. Smith, president, E. R. Sullivan, vice president and Chas. A. Bray, secretary and treasurer.

New Kiln Installed at Phoenix Birmingham Plant

THE foundation is now ready for the new kiln of the Phoenix Portland Cement Co. at its Birmingham, Ala., plant. This kiln will be the plant's fourth and is the same size as the others, 10 feet in diameter and 150 feet long. A new Bradley mill and tube mill are to be installed for the new kiln.

Preliminary work is now being done in New Orleans, La., for the new plant that is to be built there by the company.

It is expected that ground will be broken in a short time. A crew of men is already on the job. Construction will be under the direction of R. J. Hawn, superintendent of the Birmingham plant.—*The Dixie Manufacturer*.

Limestone Products Company Enlarging Plant

THE Limestone Products Co., is making several additions to its plant at Menominee, Mich. A building 20x65 ft. is being constructed of sand lime brick for the manufacture of hydrated lime and a Kritzer 6-ton per hour hydrator is being installed. The company expects the plant to be in operation by April 1. The company is also constructing two new Arnold and Weigel kilns.

The limestone rock, quarried at Rogers City, Mich., and transported by boat to the plant is a high calcium rock, the product said to show a calcium oxide content average of 98%, and is suitable for all chemical purposes especially pulp and paper manufacture.

Los Angeles Awards Contracts for Sand and Gravel

THE department of public works of Los Angeles, Calif., has awarded the following contracts in connection with section No. 25 of the north outfall sewer system: Consumers Rock and Gravel Co., 2980 tons concrete sand at \$1.05 ton and 20 tons of mortar sand at \$1.05 ton; crushed rock or screened gravel, 4000 tons passing 2½-in. screen at \$1.50 ton and 300 tons passing 1½-in. screen at \$1.50 ton.

Traffic and Transportation

By EDWIN BROOKER, Consulting Transportation and Traffic Expert
Munsey Building, Washington, D. C.

Proposed Changes in Rates

THE following are the latest proposed changes in freight rates up to the week beginning February 17:

Illinois Freight Association Docket

2766A. Sand and gravel, also crushed stone. Carloads, from Alton, Pekin, Peoria, Mackinaw and Lincoln, Ill., to destinations in Illinois, e. g.:

| To— | From Alton, Ill. | |
|---------------|------------------|--------|
| | Pres. | Prop. |
| Markham | \$1.01 | \$1.13 |
| Chapin | 1.01 | 1.13 |
| Valley City | 1.13 | 1.26 |
| Arden | 1.13 | 1.26 |
| East Hannibal | 1.22 | 1.26 |
| Golden | 1.22 | 1.26 |
| Carthage | 1.22 | 1.26 |

| To— | From | | | |
|--------------------|-----------------|-----------------|-----------------|-----------------|
| | Pekin, Ill. | | Peoria, Ill. | |
| Markham | Pres. \$1.13 | Prop. \$1.13 | Pres. \$1.13 | Prop. \$1.13 |
| Chapin | 1.13 | 1.13 | 1.13 | 1.13 |
| Valley City..... | 1.13 | 1.26 | 1.13 | 1.26 |
| Arden | 1.13 | 1.26 | 1.13 | 1.26 |
| East Hannibal..... | | 1.26 | | 1.26 |
| Golden | 1.22 | 1.26 | 1.22 | 1.26 |
| Carthage | 1.22 | 1.26 | 1.22 | 1.26 |

| To— | From— | | | |
|--------------------|----------------|--------|---------------|--------|
| | Mackinaw, Ill. | | Lincoln, Ill. | |
| | Pres. | Prop. | Pres. | Prop. |
| Markham | \$1.13 | \$1.13 | \$1.13 | \$1.13 |
| Chapin | 1.13 | 1.13 | 1.13 | 1.13 |
| Valley City..... | 1.13 | 1.26 | 1.13 | 1.26 |
| Arden | 1.13 | 1.26 | 1.13 | 1.26 |
| East Hannibal..... | | 1.26 | | 1.26 |
| Golden | 1.22 | 1.26 | 1.22 | 1.26 |
| Carthage | 1.22 | 1.26 | 1.22 | 1.26 |

3039. Sand and gravel. Carloads, minimum weight capacity of car. Proposed, from Cairo, Ill., Brookport, Ill., Metropolis, Ill., to Belle Rive, Ill., \$1.31; present, no through commodity rates in effect.

3028. Sand and gravel (except glass, silica or molding sand). Carloads, minimum weight 90% of marked capacity of car, except when car is loaded to full visible capacity, actual weight will apply, but not less than 40,000 lb. Per net ton:

| To— | From Ottawa, Ill. | |
|---------------|-------------------|----------|
| | Present | Proposed |
| Spring Valley | 76 | 63* |
| Marquette | 76 | 63* |
| DePue | 76 | 63* |

*No switching charges will be absorbed at destination.

Western Trunk Line Docket

853B. Gravel and crushed or ground stone. Carloads, from Bay City, Wis., Red Wing and Winona, Minn., to C. F. A. stations named in Items 1735B and 1740B, Sup. 2 to W. T. L. Trf. 49-0, I. C. C. A1517. Present rates apply on said carloads; proposed rates named in items referred to, to apply on sand, gravel and crushed or ground stone; carloads, minimum weight, to junction, 90% of marked capacity of car, but not less than 40,000 lb.; east of junction, 40,000 lb., except that when marked capacity of car is less, marked capacity will govern, but in no case less than 30,000 lb.

1383A. Cement, in mixed carloads, with lime, plaster and (or) stucco, from W. T. L. points to points in Minnesota, North and South Dakota. Present rates, as shown in the first exception to Item 140, W. T. L. Circular 1R. Proposed, to amend exception by including the provision: "If more than one commodity rate is in effect, the higher rate will be applied."

4382. Switching, local, rate at points in Wisconsin, also Menominee, Mich. Present, as published in C. M. & St. P. G. F. D. 4900J, C. & N. W. G. F. D. 11671R and similar tariffs of Wisconsin lines. Proposed:

Intra-terminal Switching. For switching carload freight loaded by and at an industry served by (name of carrier), industry track, consigned, hauled to and unloaded at another industry track served by same carrier, industry track:

Coal, stone, sand or gravel, minimum weight 80,000 lb. per car (except where marked capacity is less, in which event marked capacity will apply), 1½ cents per 100 lb. All other commodities, minimum weight 60,000 lb.

Intra-plant Switching. For switching movement

within same plant or industry, \$3.15 per car in addition to charges for intra-terminal or inter-terminal switching when incurred.

Inter-terminal Switching. Proposed to establish rate of 2½ cents per 100 lb., minimum weight 60,000 lb. (except on coal, stone, sand and gravel 2 cents, minimum weight 80,000 lb.).

4383. Sand and gravel. Carloads, from Clayton, Iowa, to Lincoln, Neb. Present, 24½ cents per 100 lb. (Class E); proposed, 18 cents per 100 lb. Minimum weight 90% of marked capacity of car, except that when weight of shipment loaded to full visible capacity of car is less than 90% of the marked capacity of car, the actual weight will apply. In no case shall the minimum weight be less than 40,000 lb.

Southwestern Freight Bureau Docket

3779. Sand and gravel. To establish a rate of 6 cents per 100 lb. on sand and gravel, in straight or mixed carloads, minimum weight 80,000 lb. or marked capacity of car if less than 80,000 lb., from Memphis, Tenn., to Helena, Ark. It is stated that the proposed rate and minimum weight is the scale as prescribed by the Interstate Commerce Commission in Docket No. 9702.

3786. Cement. To establish the following arbitrations on cement, carloads, as described in S. W. L. Tariff 90E, from Speeds and Sellersburg, Ind., to be used in constructing through rates to points in Arkansas, Louisiana, Missouri, etc., shown as points of destinations in S. W. L. Tariff 90E:

| To— | Cents per cwt. |
|----------------------|----------------|
| Cairo, Ill. | 12 |
| East St. Louis, Ill. | 12 |
| Hannibal, Mo. | 14½ |
| Memphis, Tenn. | 17½ |

Shippers request the publication of the above arbitrations in order that they may be in position to meet competition of other cement shipping points that are now favored with arbitrations.

3794. Cement. To establish the following rates in cents per 100 lb. on cement, carloads, as described in Item 1548 of Agent Speiden's Louisiana Tariff No. 96-B, from points shown below to Plaquemine, La.:

| Birmingham, Ala. | Cents |
|------------------------|-------|
| North Birmingham, Ala. | 29½ |
| Chattanooga, Tenn. | 31 |
| Leeds, Ala. | 29½ |
| Ragland, Ala. | 29½ |
| Richard City, Tenn. | 31 |
| Rockmart, Ga. | 31 |
| Spocari, Ala. | 26½ |
| Kingsport, Tenn. | 35 |

It is stated that the proposed rates are constructed on combination of locals on New Orleans.

3797. Chatts, stone, gravel, etc. To establish same rates on chatts, stone, gravel, etc., as described in Item 4103-A, of S. W. L. Tariff No. 26-X, from stations on D. B. & N. C. R. R. to points in Oklahoma as now apply from M-K-T of Texas points in the item referred to. It is stated that shippers located at stations on D. B. & N. O. R. R. compete with shippers at other points in Texas on the M-K-T of Texas, who now enjoy the rates published in Item 4103-A of S. W. L. Tariff 6-X, and there is no reason why the joint line rates in this item should not be made applicable from stations on the D. B. & N. O. R. R.

3844. Chatts, stone, etc. To establish the joint line scale published in Item 4103A, S. W. L. Tariff 26-X, on chatts, stone, gravel, etc., as described in the item referred to, to points in Oklahoma for application from points on the D. B. & N. O. R. R. It is stated that shippers located at stations on the D. B. & N. O. R. R. compete with shippers at other points in Texas who now enjoy the rates published in Item 4103A, S. W. L. Tariff 26-X, and there is no reason why the joint line rates should not be made applicable from stations on the D. B. & N. O. R. R.

3852. Cement. To establish the following rates on cement, carloads, to stations on the St. L. K. S. & E. R. R.:

| To— | Rates in cts. per 100 lb. |
|--|---------------------------|
| Kansas Gas Belt | 21½ |
| Ada, Okla. | 23 |
| Bonner Springs, Kansas City and Sugar Creek, Mo. | 21½ |
| Memphis, Tenn. | 12 |
| Marquette, Mo. | 14½ |

It is felt that rates via the St. L. K. S. & E. R. R. should be on an equality with the rates to points competitive with other lines.

3895. Cement. To establish a rate of 25 cents per 100 lb. on cement, carloads, minimum weight 50,000 lb., from Ada, Okla., to Round Timbers, Odell and Chillicothe, Texas. It is stated that rate to points on either side of Chillicothe, Texas, is 25 cents per 100 lb. and therefore the rate to Chillicothe should be the same as to points on either side. To Round Timbers and Odell, Texas, change necessary is to meet competition of other lines at Vernon, Texas.

Southern Freight Association Docket

18677. Crushed stone. Carloads, from Madisonville, Ky., to stations on the Illinois Central railroad in southern Illinois, Centralia and south. No through rates in effect. It is proposed to establish rates in line with rates from other shipping points. Proposed rates to representative points are: To Centralia, \$1.13; Ullin, \$1.13; Eldorado, \$1.20; Herrin, \$1.13; McClure, Ill., \$1.16 per net ton.

18774. Cement. It is proposed to establish rates on cement, carloads, as described in Agent Glenn's I. C. C. A-455, from Ragland, Ala., to stations on the Southern Ry. in eastern Tennessee, same as from Birmingham, Ala. From Portland, Ga., same as from Rockmart, Ga. Lowest combination now applies.

18791. Slag. It is proposed to reduce the present rates on slag, carloads, from Boyles and Birmingham, Ala., to Pass Christian, Miss., to be \$1.69 per net ton, same as present rate from North Birmingham, Gate City and Hiawatha, Ala., also to observe this rate as maxima from Boyles, Ala., to stations on the N. O. & M. division of the L. & N. R. R., Pascagoula, Miss., through Menze Ave., Miss.

18793. Sand and gravel. Carloads, from Arrowhead, Cateelous Spur, Chehaw, Cooks, Millstead, Mount Meigs and Rice, Ala., to Nashville, Tenn. Lowest combination now applies. Proposed, \$2.10 per net ton, same as rate in effect from Montgomery, Ala.

18809. Sand and gravel. It is proposed to remove the restriction published in connection with rate of \$1.02 on sand and gravel, carloads, from Montgomery, Ala., to Alabama City, Attalla and Gadsden, Ala., allowing the combination rules published in Agent Jones' Tariff No. 228 to apply in connection therewith.

18847. Sand and gravel. Carloads, from Montgomery, Ala., to Beaufort and Port Royal, S. C. Present rate, \$3.25; proposed, \$2.12 per net ton, based on the joint trunk line scale submitted by carriers to the Alabama and Georgia commissions, reduced 10% under Docket 13293.

18883. Sand and gravel. Carloads, from Montgomery, Ala., to Wadesboro, Fla. Present rate, \$28.50 per car of 30,000 lb., or \$1.90 per net ton; proposed, \$1.53 per net ton, based on the Trunk Line Single Line scale, submitted by carriers to the Georgia and Alabama commissions, reduced 10%.

18888. Cement. Carloads, from points in Maryland, New Jersey, New York, Pennsylvania and West Virginia taking Group of Origin Nos. 1, 2, 4, 6 and 7 of Agt. Cottrell's I. C. C. 464 to Portland, Ga. Lowest combination now applies. Proposed, same as in effect to Rockmart, Ga.

Central Freight Association Docket

10107. Gravel and sand. Lorain, Ohio, to Cleveland, Ohio. Present, 70 cents per net ton; proposed, 60 cents per net ton.

10108. Crushed stone and screenings. Hillsville and Walford, Penn., to Leckrone, Penn. Present, \$1.60 per net ton; proposed, \$1.75 per net ton.

10112. Gravel and sand (other than blast, engine, foundry, glass, molding or silica sand). Lafayette, Ind., to points in Indiana. Per net ton:

| To— | Present | Proposed |
|--------------|---------|----------|
| Randle | \$0.84 | \$0.75 |
| Della | .84 | .75 |
| Moody | .84 | .75 |
| Lewiston | .84 | .75 |
| Newland | .84 | .75 |
| Gifford | .84 | .80 |
| Laura | .84 | .80 |
| McGlinn | .84 | .80 |
| Zadoc | .84 | .80 |
| Kersey | .84 | .80 |
| Pense Switch | 1.00 | .85 |
| Grape Island | 1.00 | .85 |
| Beech Ridge | 1.00 | .90 |
| Range Line | 1.00 | .90 |
| Dinwiddie | 1.00 | .90 |

10115. Crushed stone. Greencastle and St. Paul, Ind., to Indiana. Present and proposed rates, as per Exhibit "A."

10121. Stone, viz.: Crushed in bulk, open top cars only. Evansville, Ind., to Mt. Vernon, Ind. Present, 92 cents per net ton; proposed, sixth class rate of 6½ cents per 100 lb.

10124. Crushed stone and stone screenings. Annandale, Branchton, Harrisville, Osbornes and Wick, Penn., to Coughanour Mine, Dumas, Anspach, Beachley Mine, Listonburgh, Unamis, Charlestown, Horseshoe Bottom, Flamingan, Tub Run, Summerfield, Watson, Pageices, Buffalo Run, Shelbysport, Friendsville, McCullough Mine No. 1 and Kendall, Md. Present, \$3.35 per net ton; proposed, \$1.70 per net ton.

10126. Crushed stone. Centerville, Ohio, to London, Ohio. Present, 80 cents per net ton; proposed, 70 cents per net ton.

10143. Crushed stone. Monon, Ind., to (a) Valparaiso, Wheeler and Hobart, Ind.; (b) Runnymede, Ind. Present, 92 cents per net ton; proposed (a), 77 cents per net ton, (b) 80 cents per net ton.

10149. Crushed stone. White Sulphur, Ohio, to Morrow, Plainville and Kennedy, Ohio. Present, 15 cents to Morrow and 17 cents to Plainville and Kennedy, Ohio; proposed, 90 cents per net ton to Morrow, Ohio, \$1 per net ton to Plainville and Kennedy, Ohio.

10152. Sand and gravel. Attica, Ind., to Illinois. Present, sixth class; proposed, \$1.13 per net ton to Beardstown, Bluff Springs, Cass, Virginia, Burlingame, Philadelphia, Gurney, Ashland, Pleasant Plains, Richland, Farmingdale, Bradfordton, Lakewood, Cowden, Holliday, Beecher City and Moccasin, Ill.; \$1.26 per net ton to Gilmore, Edgewood, Iota, Riffle, Louis, Flora, Rinard, Cisne, Geff and Fairfield, Ill.

10154. Cement, common, hydraulic, natural or portland. Chicago, Ill., Coldwater, Quincy and Detroit, Mich.; also Bay Ridge, Ohio, to Ohio and in Michigan. Present and proposed rates, as shown in Exhibit "A."

10166. Sand and gravel. Amherst, Ceylon and Huron, Ohio, to Fremont, Clyde, Bellevue, Monroeville and Norwalk, Ohio. Present, 90 cents per net ton to Fremont and Clyde, Ohio; 80 cents per net ton to Bellevue, Monroeville and Norwalk, Ohio. Proposed, 80 cents per net ton to Fremont, Ohio; 70 cents per net ton to other destinations.

Commission Institutes Cement Rate Inquiry

THE commission has instituted, on its own motion, No. 16640, limestone into and cement out of Ada, Okla. Hearing began at Kansas City by Examiner Weaver on February 21. The order instituting the inquiry, except the part setting the hearing, is as follows:

It appearing, That there is on file with the commission, St. Louis-San Francisco Ry. Co.'s Tariff I. C. C. No. 8410, and said tariff being under consideration:

It is ordered, That the commission upon its own motion enter upon and investigation into and concerning the lawfulness and propriety of said St. Louis-San Francisco Ry. Co.'s Tariff I. C. C. No. 8410, which tariff publishes rates, rules and regulations governing the transportation of limestone and shale from Lantry and Lawrence, Okla., to Ada, Okla., in connection with the movement of cement manufactured from such limestone and shale and subsequently reshipped from Ada via the St. Louis-San Francisco Ry.

It is further ordered, That the St. Louis-San Francisco Ry. Co. be, and it is hereby, made respondent to this proceeding, and that a copy of this order be served upon said respondent.

This inquiry is regarded as a part of I. and S. No. 2327. That case was instituted by means of an order dated January 31, in announcing which the commission said:

By an order entered in Investiga-

tion and Suspension Docket No. 2327, the Interstate Commerce Commission suspended from February 1 and 15 until June 1, 1925, the operation of certain schedules contained in Atchison, Topeka & Santa Fe Tariff I. C. C. No. 10032 and Oklahoma City-Ada-Atoka Ry. Co. Tariff I. C. C. No. 8.

The suspended schedules propose to establish transit privileges at Ada, Okla., on crushed limestone and shale inbound from Lawrence and Lantry, Okla., on the St. L. & S. F. Ry. and cement outbound from Ada, and provide that the rate applicable on cement from the transit point to final destination shall be applicable on the outbound shipment, but that refunds would be made on the inbound shipments in amounts not exceeding \$6.60 per car of 80,000 lb. capacity and \$8.25 per car of 100,000 lb. capacity.

As understood by the men of the commission who handled the protested schedules, the Santa Fe and the Oklahoma City-Ada-Atoka R. R. Co., by means of transit privileges at Ada, proposed to meet a situation on the St. Louis-San Francisco brought about by the tariff filed by that carrier, by granting a transit privilege at Ada, on crushed limestone and shale, inbound, from two points on the Frisco, and cement, outbound from Ada, and provide that the rate applicable on cement from the transit point to final destination should be applicable on the outbound shipment, but that refunds would be made on the inbound shipments in amounts not exceeding \$6.60 per car of 80,000 lb. capacity and \$8.25 per car of 100,000 lb. capacity.—*Traffic World*.

Refuse to Reduce Cement Freight Rates

THE department of public works of Washington refused to reduce the freight rates on cement from Seattle to Yakima, Wash., and dismissed the complaint brought by W. F. Jahn and Co. against the Northern Pacific railroad.—*Seattle (Wash.) Star*.

Discuss Fertilizer Rate Reduction for Southern States

PLANS for reduction in fertilizer rates were discussed at a session of members of railroad commissions and public service commissions of eight southern states held recently in Atlanta, Ga. A. J. Maxwell, president of the railroad commission of North Carolina, presided.

The question of reducing fertilizer rates is a live one in all the southern states and the commissioners have been working for several months in an effort to reach an agreement on a concerted plan of action.

Among states represented at the conference were Georgia, Florida, North Carolina, South Carolina, Virginia, Alabama, Tennessee and Mississippi.—*Atlanta (Ga.) Constitution*.

Sand and Gravel Rates

EXAMINER W. M. Cheseldine, in No. 15559, Western Indiana Gravel Co. vs. New York, Chicago & St. Louis et al., said the commission should find rates on sand and gravel from Lafayette, Ind., to points in Illinois, unreasonable and unduly prejudicial to the extent they exceed those made in accordance with figures set down by him in his report. He said:

The commission should find that the rates assailed are unreasonable and unduly prejudicial to the extent that the rates from Lafayette exceed or may exceed the following amounts:

Stations and Rates Prescribed

Wabash Railway: Tolono, 78c; Streator, \$1.10.

Illinois Central: Alvin, 74c; Rantoul, 88c; Tomlinson, 88c; Laurette, \$1; Leroy, \$1; Champaign, 88c; Tuscola, \$1; Arcola, \$1; Mattoon, \$1; Ludlow, 88c; Staley, 88c; Greens Switch, \$1; Turpin, \$1; Sullivan, \$1; Coles, \$1; Elwin, \$1; Assumption, \$1.10; Pana, \$1.10; Ramsey, \$1.20; Vandalia, \$1.20.

Baltimore & Ohio: Springfield to Alton, \$1.10.

Kankakee & Urbana: Rantoul, \$1; Wess-lund Park (Paxton), \$1.

Illinois Traction: Westville to Ridge Farm, 88c; Bronson to Champaign, 88c; Monticello to Decatur, \$1; Riverton, \$1.10; Maroa, \$1.10; Clinton, \$1.10; Bloomington, \$1.20; Mackinaw, \$1.20.

In the absence of undue preference or prejudice the commission has no authority under the act to require the absorption of connecting lines switching charges. There is no such similarity of service from its competitors' plants at Attica as to justify a finding of unjust discrimination. No violation of section 13 of the act is alleged.

By schedules filed since the hearing the carriers proposed to increase the rates on sand and gravel from Attica and Lafayette to Danville, Champaign and certain other points here under consideration, but on protest the proposed rates were suspended. (Investigation and suspension Docket No. 2307 not yet heard.) The findings here proposed are without prejudice to any conclusion that may be reached in other proceedings on a more complete record.—*Traffic World*.

Cement Company Gets Freight Reparation

AN award of reparation has been made in No. 15558, Dixie Portland Cement Co. vs. Nashville, Chattanooga & St. Louis et al., mimeographed, on a finding of unreasonableness as to the rate on cement from Richard City, Tenn., to Normal, Tenn., applied on three carloads shipped in April and May, 1922. The Commission found the rate unreasonable to the extent it exceeded 19 cents and ordered reparation to that basis.—*Traffic World*.

Railway Construction Outlook

IN ORDER that our readers may have accurate information regarding the amount of work which is in prospect for this year, the supply and character of labor available and the extent to which the demand for labor will be offset by the increased use of mechanical equipment, we present reports which have been given us by engineers on prominent railways, selected because of their ability to provide information representative of the entire country. These letters confirm the forecast in the January issue to the effect that the amount of work on the program for 1925 will be equal to or in excess of that of 1924, which in turn was only slightly below that of 1923 in the magnitude of expenditures and exceeded it in the amount of work completed. The activity will be relatively uniform throughout the country. With the possible exception of a few of the more active industrial centers the indications also point to an adequate supply of labor to meet all requirements.

A noticeable feature of these letters is the uniform report of increasing efficiency of labor which characterized 1924 and which is expected to continue throughout this year. Supplementing this is the uniform recognition of the value of mechanical equipment in improving the quality of work and reducing the number of men required. The increasing use of this equipment is the natural outgrowth of the reduction in the hours of labor and the marked increase in wage rates during the last few years and is a development which may be expected to proceed with increasing rapidity in the future. With the increasing use of labor saving equipment there is a growing recognition of the fact that this equipment must be made to earn a return if its further application is to be warranted.—*Railway Engineering and Maintenance.*

Yosemite Portland Cement Company Reorganized

QUARRIES and plant site of the Yosemite Portland Cement Co., Fresno, Calif., have been taken over by the recently incorporated Yosemite Portland Cement Corporation, which plans to erect a modern cement manufacturing plant having a capacity of approximately 2000 bbl. per day. The company plans to construct through its own facilities and will be in the market for materials and equipment. This will be the only cement plant in the San Joaquin valley. Its capitalization is \$1,500,000. A. Emory Wishon is president; Murray Bourne, secretary, both of Fresno, and these together with W. H. Sutherland, Clyde Waterman and John B. Olcese are the directors. Besides road building and the increased demand for cement and industrial activities, the company's output will be absorbed by the large construction program in the irrigation district and the extensive power development planned in that district.—*Iron Age.*

Universal Portland Cement Co. to Build New Plant

THE following statement of the plans of the Universal Portland Cement Co. for building a new cement plant in addition to the docks and material handling plant, described in the February 21 issue of *Rock Products*, has been received from official sources.

"The Universal Portland Cement Co. has asked for bids on a contract for the construction of a harbor at its Buffington, Ind., plant, near Gary. The harbor will extend several hundred feet into the lake from the present shore line. Facilities will be provided for receipt and storage of raw materials, such as limestone, blast furnace slag and coal on the dock, also for the shipment of cement.

"In addition to the above the company will soon ask for bids on a traveling bridge for use on the dock, also for a system of conveyors which will take the raw material from the dock to the raw material buildings of the various mills. The plans include an entirely new modern cement plant adjacent to the dock with facilities to load directly into boats for delivery to ports on the Great Lakes.

"The Buffington plant is the largest portland cement plant in the world, producing approximately 9,000,000 bbl. of cement annually. The company also has other plants at Pittsburgh and Duluth."

Building Rides on an Even Keel

REPORTS from observers all over the country indicate that more building is contemplated in the small cities and towns and on the country side than for several years. The good returns from last year's crops will furnish funds for needed construction in many localities where for several years building has been at a standstill. The amount of such new construction in any locality will be largely in proportion to the revenues from the harvests of 1924 in that locality; and much of it will be in the form of silos, barns, corn cribs, and the like, on the farms.

In the large cities there is much construction partly under way, and partly contracted for that will furnish the principal volume of building in these centers. Most of the new building in cities will be in the industrial districts where the prospect of steady employment has created a demand for more and better housings for the workingmen. Public works will also figure largely in the amount of building undertaken, for people generally have manifested a willingness to tax themselves for such improvements.

Taking the situation by and large, it seems that 1925 will be a year of much construction, close to 1924 in volume, but marking the beginning of the end of that unparalleled era of construction that had its inception in 1919. Assurance of the continu-

ance of widespread activity of this great industry, which employs so many men and consumes so much material, adds greatly to the certainty of steadily improving business conditions during the coming months.—Archer Wall Douglas in the *Business Bulletin* of the La Salle Extension University, Chicago.

German Cement Industry in 1924

HOPES for a revival of building activity in Germany held out by the cement industry have not been realized. Lack of capital and the continued rent regulation by the authorities over dwellings, apartments, manufacturing lofts, etc., have greatly retarded the construction of new buildings. Furthermore, strikes in the building trades have also hindered favorable development. Under these circumstances it is not surprising that the demand for cement was materially decreased. Total sales of cement in 1924 did not by far amount to 50 per cent of the sales before the war.—*American Chamber of Commerce in Germany.*

Linwood Cement Company Elects Officers

AT a meeting of the stockholders of the Linwood Cement Co., Davenport, Iowa, officers and directors were elected as follows: President, A. E. Horst; vice-president and general manager, A. C. Steece; vice-president, C. C. Hagermann; secretary and treasurer, John F. Schroeder; general counsel, A. E. Carroll; other directors, J. C. Buckbee and E. R. Schroeder.

Seventy-five stockholders were present at the meeting and J. C. Buckbee, director of the company and president of the engineering firm of Chicago which is building the plant, told of the progress in the construction of the new cement plant which will probably be completed this summer.—*Davenport (Iowa) Democrat.*

City Wishes to Use New York Canal Terminal for Road Materials

THE commissioner of public works of Oswego, N. Y., is making negotiations with the state department of works for permission to utilize a portion of the terminal of the barge canal for the shipment into that port of crushed stone, cement and sand for the construction of concrete pavements during the coming season.

The city wants to build a storage bin at the terminal into which to unload the crushed stone, which it expects to get from quarries on the Hudson river and sand which it will possibly procure from New Haven, N. Y. According to the *Oswego (N. Y.) Palladium*, the city also contemplates bringing its cement by water, thus saving in freight rates and materially furthering the road building program.

Cement Products

TRADE MARK APPLIED FOR WITH U.S. PATENT OFFICE

Concrete Products at the American Concrete Institute Meeting

Committee Reports Show Important Results
Obtained in Making Tests on Plant Product

CONCRETE products received its full share of attention at the meeting of the American Concrete Institute which closed on February 7. Committee P-6, on concrete products made an important report and there were lively discussions on various features of products manufacture. One of the evening sessions was given to a demonstration of the design of a concrete mix for making concrete products. A report of this is given in the pages which follow.

From the practical man's standpoint, perhaps the most important report was made by a sub-committee of Committee P-6, on the work of the committee in making and testing blocks at the factory of the Humboldt Gravel and Tile Co., Humboldt, Iowa. The purposes of this test were to apply the principles of concrete design to making concrete products, to study mixes for commercial use, to determine the effect of letting concrete stand after mixing and to determine the effect of different methods of curing.

The aggregate that was used in these tests was taken from the regular stock at the factory and was mixed to have a fineness modulus of 3.69. The mixture contained: 60% No. 2 sand; 20% "torpedo" sand; 10% of No. 5 pebbles and 10% of asphalt sand. This mixture was made from calculations to give a fineness modulus of 3.69. In order to test the accuracy of the calculation and mixing, a number of samples of the mixed aggregate were screened and the fineness modulus determined. The determinations varied from 3.64 to 3.71, which is a sufficient proof of the accuracy of the calculation and the work.

The unit weight of the mixed aggregate was determined at 110 lb. per cubic foot, dry and rodded, and 93½ lb. in the damp, loose condition in which it was used.

Fine Sand Added

The asphalt sand was a very light sand weighing only 75 lb. per cubic foot. It was

purposely added to study the effect of fine material in the mix. It was the opinion of the committee that the addition of this fine sand gave a little more workability to the mix and in the discussion which followed a member said that he had found that the addition 5 to 10% of fine sand gave tenacity to the mixed product which aided it in the moulding.

Various mixes were tried, the mixes being made by volume and the volume calculated from the weight. Thus a 1 to 5 mix by weight was figured at 1 to 4.18 by volume and a 1 to 9 mix by weight to 1 to 7.5 by volume. An Ideal mixer was employed. Each batch was made of 500 lb. of aggregate, the cement and water being changed according to the test that was being made.

Mixing was carried on for 6 minutes but in some of the tests the materials were mixed 3 min. dry and then 3 min. after the water had been added. In other cases the water was added at the start of the 6 min. mixing.

After mixing, some of the tile (the product which was being studied) were made immediately. In other tests the mixed concrete was held for ½ hr., 1 hr. and 2 hr., as one of the purposes of the test was to determine how long concrete could be held after mixing without deteriorating.

The tile was a standard tile, exposing 42% of the gross area and was given 8 blows in tamping.

After the tile were taken from the machine they were cured for 21 days in a steam room, the temperature being held at 70 deg. F. They were shipped to the Lewis Institute laboratory for testing.

Water Ratios Studied

Since the water cement ratio is the most important factor in the design of concrete, the effect of different water cement ratios was carefully studied. A curve was shown giving the relations between the strength and the water cement ratios in a

1 to 4 mix and a 1 to 5 mix. With the 1 to 4 mix water cement ratios of 1 to 1, 1 to 0.95 and 1 to 0.9, were tried. The first was found to be too wet for good workability, and it gave the lowest strength. The 1 to 0.9 ratio was too dry for good workability and gave almost the same strength as the 1 to 1 ratio. The 1 to 0.95 ratio gave the best workability and also the best strength.

Comparative results were obtained with water cement ratios in the 1 to 8 mix. Ratios of 1.35, 1.45 and 1.39 were tried, the intermediate figure giving the best workability and the best strength. In every case the best workability seemed to be with the water cement ratio that gave the highest strength. The best water cement ratio for a 1 to 9 mix was found to be 1.61.

The important thing about these water cement ratios is that on plotting them on a chart they are found to lie on a straight line. That is, if these mixes, 1 to 4, 1 to 8 and 1 to 9, are set off as distances to the left, and the best water cement ratios, 0.95, 1.39 and 1.61 are set off as heights, the line connecting these points will be straight. If we want to find the water cement ratio for any other mix than those given, we have only to measure down from this line to the base. The water cement ratio found in this way will be the best for both strength and workability.

The effect of holding the concrete after mixing for ½ hr., 1 hr. and 2 hr. was found to be very slight in its effects on both the workability and the strength of the product. There was a slight decrease in strength in the tile made of the concrete which had been held longest.

The different methods of mixing showed little or no difference in the strength of the tile. The strength was the same whether the materials were mixed three minutes dry and three minutes wet or all six minutes wet.

The relation between the strength of the product and the mix (the proportion of aggregate to cement) was found to make a straight line curve in the same way as did the mix and the water cement ratio. This, of course, means only the strength of the product increases directly with the amount of cement that is used, provided the correct water cement ratio is used. Various proportions of cement to aggregate were tried to prove this, from 11 lb. cement to 100 lb. of aggregate (practically a 1 to 9 mix) to 25 lb. of cement to 100 lb. of aggregate (a 1 to 4 mix).

The manufacturer who makes a chart of this kind from his own cement and aggregate will be able to pick off from it any mix that he needs to make a product of a required strength. If he is making a product that is stronger than is necessary to meet local conditions he can tell at once how much to reduce his cement and still have his product meet specifications.

Absorption Tests

Absorption tests were made on the tile and these ran from 5.9% to 9.5%. The tests seemed to show that there was an intimate relation between the absorption percentage and the water cement ratio, since, as in the case of the water cement ratio, the absorption percentages had a "straight line relation."

A fact that will interest all workers in concrete was brought out by these tests. This was that the strengths for different water cement ratios were uniformly higher than those given by Prof. Abrams in his Bulletin No. 1 by about 300 lb.

Cylinders were made from the same concrete that was used to make the tile that were tested and these cylinders were tested for strength. They were given one day in the curing room and then kept in water for the remainder of the curing period. These cylinders when tested gave 10 to 14% higher strengths than the corresponding tile made from the same mixes. This was explained by the difference in shape of the products. The cylinder gives a much better opportunity for tamping the concrete firmly than a mould of the shape of the tile. The value of testing these cylinders was in giving a figure to use in commercial work. The strength of a cylindrical sample tested to give the strength of a certain mix should be lowered from 10 to 14% to find what the strength of a tile will be.

Curing Cement Products

Another report of this same sub-committee had to do with the curing of concrete products. Standard blocks, 8x8x16 in. were tested in this case, 303 of them being broken in the tests. These blocks were made from a mixture of $\frac{3}{8}$ -in. crushed limestone and sand from 0 to $\frac{1}{8}$ -in.

The blocks were cured in a variety of ways, starting them in moist air at 100 F. and afterward curing in the ordinary tem-

perature of the laboratory with sprinkling and without and curing them out of doors. Many interesting things were brought out as to the effect of different factors in curing. But the important points were that curing in the laboratory at ordinary temperatures with daily sprinkling gave the highest strength and curing outside gave the lowest strength.

Exhibits

The concrete products men had their headquarters adjoining the general meeting room. There was a small exhibition which attracted some little attention there. The exhibits included:

Bottles of special aggregates, shown by R. V. Reynolds, Chicago.

A head of Lincoln, a beautiful piece of work, appearing as though it had been carved from marble, by students at Mooseheart, Ill.

Cut cast stone, resembling porphyry, Onandaga Litholite Co., Syracuse, N. Y.

Roofing tile, both French and Spanish, by the Hawthorne Roofing Tile Co., Cicero, Ill. These were beautiful pieces and bore out what Mr. Allen, the manager of the company, said on the convention floor about

being able to make concrete which would not crack or craze on the surface.

Floor tile, by the Synthetic Floor Tile Co., St. Louis, Mo.

Face brick made by the Shope process by unidentified makers.

A very pretty face brick by the Merrill Moore Co., Creston, Iowa.

Samples of trim stone from the Benedict Stone Corp. These appeared to be of fine-textured granites and sandstones, but it was said that they were all made from marble aggregates. This is the stone that was used on the Chicago stadium.

Carborundum faced tile by the DeSmet Quality Tile Co., Chicago.

Pipe elbow by the Chicago Stone Conduit Co., which had a very smooth finish inside and out.

A building block of Haydite aggregate. Haydite is an aggregate made from burned shale by a patented process developed in Omaha and Kansas City. It is lighter in weight than stone or gravel and it has the further advantage that nails can be driven into it without splitting the block. The block shown had several pieces of wood nailed on one side.

Designing a Mixture for Concrete Products

AT the Concrete Institute meeting one of the evening sessions was given to a demonstration of figuring a mixture for making concrete products. Stanton Walker, assisted by J. W. Lowell, C. L. Bourne, and J. W. Kelley, was in charge, this being a meeting under the joint auspices of Committee P-6 of the Institute, the Portland Cement Association, and the Structural Materials Research Laboratory of the Lewis Institute.

Before beginning his demonstration, Mr. Walker spoke on some differences between the "dry" or "semi-wet" mixes used in making concrete products by machinery and the plastic concrete used in formwork. In plastic concrete the effort is made to use the lowest water-cement ratio possible, since there is bound to be enough water to combine with the cement. In "semi-wet" mixtures the consistency of the concrete has to be kept dry in order that the product shall strip from the mold without sagging. In the case of plastic concrete "slump" is necessary to give plasticity. In the case of concrete products "no slump" is necessary or the product cannot be removed from the mold. So it is often necessary to increase the water in the mix to get the required strength.

To illustrate, Mr. Walker showed a curve of the strength of concrete as compared with the water-cement ratio. The strength falls off rapidly from a critical point both ways; that is, with the use of either more water or less water. Concrete products are made

from concrete on the "dry side" of the curve, hence the effort should be to use as much water as possible and still maintain a mixture that will not sag or slump when the mold is stripped.

After giving other factors which might affect the strength of the product, Mr. Walker proceeded to design a concrete mix, suitable for concrete products, from materials that had been brought in for the purpose.

In this work he used a set of standard Tyler testing sieves, and scales for weighing the different sizes of sand. A sheet metal cylinder, holding $\frac{1}{2}$ cu. ft., and of the same diameter as the height was used for measuring sand to find the weight per cubic foot.

The work was done to mix an aggregate which should have a fineness modulus of 4.00. A number from his audience wanted to know why this figure 4.00 was chosen and what it meant. It was explained that the fineness modulus was only a measure of the size and grading of the aggregate and that the method of finding a fineness modulus would be shown. The reason for choosing 4.00 is that, according to a chart which he showed, this had been found to be the most economical fineness modulus in a certain plant. But every plant has to do some experimenting in order to find out what is the best fineness modulus to use.

Mr. Walker might have pointed out that the whole advantage of designing a mix lies in the fact that the products man can

work toward definite results instead of trying out one combination after another, with no very clear idea as to where his work is leading. By using this method he may start with a given fineness modulus such as 4.00 and a given mix such as 1 to 7. If he thinks he can make as good a block with a little more aggregate and a little less cement he can quickly calculate a new mixture, with a fineness modulus of 4.25 or 4.50. This will give him a stronger product and if he thinks a weaker mix will give a sufficiently strong product he can reduce the amount of cement somewhat, say to a 1 to $7\frac{1}{2}$ or 1 to 8 mix. But the point is that by working in this way he has always definite figures from which to start and a definite figure toward which to work.

Mr. Walker had two aggregates, sand and gravel, all of which passed a $\frac{3}{4}$ -in. screen. His first step was to screen each of these through a set of Tyler standard screens.

After the sand was screened he poured the sand remaining on each screen into the pan on the scales, reading the weight as the contents of each screen was added. The weights were:

| Remaining on | Weight in oz. |
|-------------------------|---------------|
| $\frac{3}{4}$ -in. | 0. |
| 4-mesh | 0.8 |
| 8-mesh | 6.1 |
| 14-mesh | 11.3 |
| 28-mesh | 18.0 |
| 48-mesh | 28.0 |
| 100-mesh | 31.0 |

The weight of the whole sample was $31\frac{1}{4}$ oz., so to reduce these weights to percentages, each weight was divided by 31.25, giving this table:

| Size of screen | Pct. remaining on each |
|-------------------------|------------------------|
| $\frac{3}{4}$ -in. | 0 |
| 4-mesh | 3 |
| 8-mesh | 20 |
| 14-mesh | 36 |
| 28-mesh | 58 |
| 48-mesh | 90 |
| 100-mesh | 98 |
| Total | 305 |

To find the fineness modulus of the sand he divided this total of the percentages remaining on each mesh size by 100, giving 3.05.

In the same way the gravel was screened and the weights remaining on the various screens converted to percentages with the following result:

| Size of screen | Pct. remaining on each |
|-------------------------|------------------------|
| $\frac{3}{4}$ -in. | 0. |
| $\frac{3}{8}$ -in. | 19.0 |
| 4-mesh | 97.5 |
| 8-mesh | 98.0 |
| 14-mesh | 100.0 |
| 28-mesh | 100.0 |
| 48-mesh | 100.0 |
| 100-mesh | 100.0 |
| Total | 614.5 |

Dividing this total by 100 gave 6.14 as the fineness modulus of the gravel.

The next step would naturally be to combine these two to make an aggregate with the fineness modulus required, 4.00. But before doing this it is better to find the unit weight of both the sand and the gravel.

The unit weight is the weight per cubic foot, in this case. A cylinder of about the same diameter as the height and holding $\frac{1}{5}$

cu. ft. is filled with some of the sand that has been dried. According to the American Society of Testing Materials rule, the sand is put into the cylinder in three layers, each layer being rodded with a "bullet pointed" rod, about $\frac{1}{2}$ -in. in diameter, from 20 to 30 times. Mr. Walker did this and then weighed the sand and the cylinder, subtracted the weight of the empty cylinder to find what the sand weighed. The weights were:

| | |
|----------------------------------|--------|
| Weight of cylinder and sand..... | 40 lb. |
| Weight of cylinder empty..... | 17 lb. |
| Weight of sand..... | 23 lb. |

Since the cylinder held $\frac{1}{5}$ cu. ft. the sand weighs 5×23 , or 115 lb. per cu. ft. in a dry, rodded condition.

In the same way the weight of the gravel was determined at 110 lb per cu. ft. in a dry rodded condition.

But both sand and gravel are damp. As everyone knows now-a-days, damp sand "bulks," that is it takes up more space than the same sand dry.

To find how much sand in a damp, loose condition will equal a cubic foot of sand in a dry rodded condition, Mr. Walker used the same cylinder and filled it with damp sand without rodding. The weights in this case were:

| | |
|-----------------------------------|--------|
| Weight of cylinder with sand..... | 35 lb. |
| Weight of cylinder alone..... | 17 lb. |
| Weight of sand..... | 18 lb. |

The damp loose sand therefore weighs 5×18 or 90 lb. per cu. ft.

In the same way he found that the damp loose gravel weighed 95 lb. per cu. ft.

Mr. Walker then had the following figures from which to make his calculations:

| | |
|--|---------|
| Fineness modulus of sand..... | 3.05 |
| Fineness modulus of gravel..... | 6.14 |
| Dry weight per cubic foot, sand..... | 115 lb. |
| Dry weight per cubic foot, gravel..... | 110 lb. |
| Moist weight per cubic foot, sand..... | 90 lb. |
| Moist weight per cubic foot, gravel..... | 95 lb. |

The first step was to find how much sand with a fineness modulus of 3.05 must be put with gravel of a fineness modulus of 6.14 to give a fineness modulus of 4.00.

The percent of sand in the mixture is found by one of Prof. Abram's formulas which reads:

$$A - B$$

$$\% = \frac{A - B}{A - C}$$

$$A - C$$

Where A is the fineness modulus of the coarse aggregate (6.14), B is the fineness modulus required (4.00) and C is the fineness modulus of the fine aggregate (3.05).

Substituting the figures in the formula gave:

$$\frac{6.14 - 4.00}{6.14 - 3.05} = 0.69 \text{ (about)}$$

The mixture will therefore contain 69% of sand and 31% of gravel.

All concrete design according to Prof. Abram's theory is based on the true mix. We know that if a cubic foot of sand and a cubic foot of gravel are mixed together we will not have two cubic feet of mixed aggregate as some of the sand will go in the spaces in the gravel. The weight per cubic foot of this true mix therefore had next to be found.

Mr. Walker had dry sand and gravel from previous weighings. He mixed these in the right proportions by weighing out 31 lb. of gravel and 69 lb. of sand which were mixed together thoroughly. A part of this mixture was filled into the cylinder in the layers, rodding each 25 times, and the weight of the mixture in the cylinder was found to be 24 lb. The weight per cubic foot was therefore 5×24 , or 120 lb.

The mix (proportion of cement to aggregate) had been decided on in the beginning as 1 to 7. That is one sack of cement (1 cu. ft.) to 7 cu. ft. of dry rodded mixed aggregate. This had been shown to weigh 120 lb. per cu. ft. The 7 cu. ft. therefore would weigh 840 lb.

But the sand and gravel to be used were in a damp loose condition, and hence more than 7 cu. ft. must be used. To find out how much more was the next step.

There was:

| | |
|--|---------|
| 69% of sand at 115 lb. per cu. ft. = | 78 lb. |
| 31% of gravel at 110 lb. per cu. ft. = | 34 lb. |
| Total | 112 lb. |

$$\frac{840}{112} = 7.5 \text{ cu. ft. (about) of sand and gravel.}$$

Separate and not mixed.

Then: 69% of 7.5 cu. ft. would be 5.2 cu. ft. and 31% of 7.5 cu. ft. would be 2.3 cu. ft.

The mix then would be: 1—5.2—2.3 for dry rodded materials.

As the dry materials have a different weight from the damp loose materials the mix to be used would differ from this. To find out what the difference would be Mr. Walker multiplied the cubic feet of sand and gravel by the weight of each, dry, and divided by the weight in a damp loose state. The figures were:

$$\frac{5.2 \times 115}{90} = 6.6 \text{ (cu. ft. of damp loose sand)}$$

$$\frac{2.3 \times 110}{95} = 2.6 \text{ (cu. ft. of damp loose gravel)}$$

This would change the mix from 1—5.2—2.3 to 1—6.6—2.6. In other words, if a mixture is made of 1 sack of cement, 6.6 cu. ft. of the damp loose sand used in the test and 2.6 cu. ft. of damp loose gravel, the result will be concrete with a 1 to 7 mix and an aggregate which has a fineness modulus of 4.00, which is what it was aimed to produce.

Mr. Walker stopped here but it may be interesting to show how easily this figure of 4.00 could be changed to 4.50 with the figures given. The most of the work has already been done so that is mainly necessary to change the calculations:

First to find the percentage of the sand for a fineness modulus of 4.5 by the formula:

$$A - B$$

$$\% = \frac{A - B}{A - C}$$

$$A - C$$

Substituting we have

$$\frac{6.14 - 4.50}{6.14 - 3.05} = .53$$

The mixture will therefore contain 53% of sand and 47% of gravel.

The weight of the mixed aggregate, dry and rodded would have to be found in the cylinder as before. Suppose it is found to be 123 lb.

Then $7 \times 123 = 861$ lb., the weight of the aggregate in the new mix.

The 53% of sand would weigh..... 61 lb.
The 47% of gravel would weigh..... 52 lb.

Total113 lb.

Dividing as before, to get the cubic feet in the mix:

$$\frac{861}{113} = 7.6$$

53% of 7.6=4 and 47% of 7.6=3.6.

The mix on dry rodded materials would be therefore 1—4—3.6.

To find the mix on damp loose materials:

$$\frac{4 \times 115}{90} = 5.1$$

and

$$\frac{3.6 \times 110}{95} = 3.9$$

For one sack of cement we will therefore use 5.1 cu. ft. of sand (damp and loose) and 3.9 cu. ft. of gravel (damp and loose). The result will be concrete of a 1 to 7 mix and containing aggregate having a fineness modulus of 4.5.

If such a block tests stronger than is necessary a mix containing less cement such as 1 to 7.5 may be figured in the same way.

Recommended Practice for Making Concrete Products

COMMITTEE P-6 of the American Concrete Institute submitted its report covering the manufacture of concrete brick block and building tile, at the recent session of the American Concrete Institute. The first part of the report dealt with materials. Under the heading "Cement," it was recommended that cement should meet the A. S. T. M. specifications and be stored away from moisture and in a room free from drafts. Where bulk cement is used it is most accurately measured by weight.

Aggregates

Under aggregates, the report says in part:

"Aggregate should consist of sand pebbles, crushed stone, crushed blast furnace slag, or other approved inert materials with similar characteristics or a combination thereof, having strong durable grains free from injurious amounts of dust, lumps, soft or flaky particles or shale, and should not contain injurious amounts of vegetable or other organic matter as determined by the colorimetric test. The diameter of the largest particle should not be greater than one-half of the thickness of the thinnest wall of the concrete building unit in which it is used.

"In no case should aggregates containing frost or lumps of frozen material be used."

Both the decantation test and the colorimetric test are described. The colorimetric test has been so often published that is is omitted here. The decantation test for determining clay and silt is as follows:

"Injurious amounts of very fine materials in the fine aggregate, such as silt and clay, can be determined by the following method: Fill a 32-ounce graduated prescription bottle to the 14-ounce mark with the fine aggregate to be tested; add water to the 28-ounce mark; shake vigorously for one (1) minute; allow to settle one hour. If more than one and one-half

(1½) ounces of sediment appears above the fine aggregate, the material represented by the sample should be rejected. It is not contended that concrete masonry units can not be made with aggregate containing more fine materials than the 10% indicated by this test and still meet Standard American Concrete Institute Specifications. Such aggregate may require enough additional cement to render its use uneconomical."

Heating the aggregate in winter is recommended as it assists in early hardening.

Water which is safe for drinking is said to be safe for making concrete. Heating the water in winter is advised.

Under "Pigment" the report says:

"Only mineral pigments shall be used. These pigments shall be fully guaranteed by their manufacturer to contain no ingredients which will be affected by lime cement and weather."

Proportion of Cement to Aggregate

The report says that the proportion of cement to aggregate shall be such that the product will conform in strength and absorption to the requirements of the American Concrete Institute, or with local building codes. The Institute requirements are given in the following table:

| CONCRETE BUILDING BLOCK AND BUILDING TILE | | |
|---|------|------|
| Compressive Strength, lb. per sq. in. of gross cross-sectional area as laid in the wall | | |
| Average of 3 Min. for Individual Units | | |
| Heavy load bearing block or tile | 1200 | 1000 |
| Medium load bearing block or tile | 700 | 600 |
| Non-load bearing block or tile..... | 250 | 200 |

| CONCRETE BRICK | | |
|---|------|------|
| Compressive Strength, lb. per sq. in. of gross cross-sectional area as laid in the wall | | |
| Average of 5 Min. for Individual Specimens | | |
| All concrete brick | 1500 | 1000 |

"Absorption" is treated as follows by the report:

"Maximum absorption of concrete building block and building tile is 10% of

the dry weight of the unit, subject to corrections for light weight aggregate concrete. The maximum absorption for concrete brick is 12% of the dry weight of the brick. The methods of testing are described in the Tentative Standard Specifications.

"The only manner in which the physical properties of a concrete masonry unit can be definitely determined is by tests in a properly equipped laboratory. Fortunately such laboratories are to be found in every section of the country."

Continuing the subject of proportioning cement and aggregate, the report goes on to say:

"The coarseness of grading of aggregate is limited by its workability in the process or type of molding machine, for when a mixture becomes harsh working, the limit of increased strength due to coarse grading has been reached. Sometimes the grading which will give concrete of the greatest strength will produce units of too rough a texture to be salable. The size of the maximum aggregate is also limited by the size and shape of the concrete unit.

"In order to determine the proper proportions of cement to aggregate to produce concrete masonry units of desired quality, units should be made and tested using different combinations of fine and coarse aggregates with various proportions of cement to mixed aggregates, such as 1:4, 1:6 and 1:8. The information thus obtained will serve as a guide to the most economical combinations of available materials."

It is strongly advised that aggregates be combined according to the fineness modulus desired for the mixed aggregate. This is explained in the report of a demonstration of the method given elsewhere in this issue.

The report, however, gives a table which is of the greatest importance in this connection as it shows the highest fineness modulus that should be used in aggregates for concrete products:

| Aggregate graded from | Economical Range of Fineness Modulus |
|-----------------------|--------------------------------------|
| 0-8 mesh | 2.50 to 2.90 |
| 0-4 " | 2.90 to 3.50 |
| 0-3/8 in. | 3.50 to 4.25 |
| 0-1/2 in. | 4.25 to 4.50 |
| 0-3/4 in. | 4.50 to 5.00 |

The use of a standard set of testing sieves is strongly recommended as a method of checking the grading, whatever method of mixing aggregates may be employed.

Consistency

Under consistency the report makes the following comment:

"Most tamped block are made too dry. Most cast block are made too wet. Under given conditions a definite amount of water is required to produce concrete of maximum strength. Any variation from this amount will reduce the strength. Variations of 50% in the strength of concrete are often observed due solely to changes in water content. It is essential, therefore, that the water used must be as carefully controlled as the proportions of cement to aggregate.

"In the tamped method, products can be made wet enough to draw free water to the surface by trowelling and show water web marks upon removal from machine. There is a natural tendency to use too dry a mix because less care in handling is required. When concrete block are made by pressure the concrete can be made wet enough so that a slight excess of water will be forced from the block when the full pressure is applied.

"Much drier mixtures may be used with wet cast block than are generally considered possible. Vibrating machines are helpful in settling the concrete."

Curing

The report gives the following instructions for curing, and says the steam curing recommendations are the minimum for a satisfactory product.

"The term 'steam curing' applies to any method of curing where concrete building units are kept in a warm damp atmosphere during the early hardening period and the heat is supplied by steam

in a curing chamber. During the curing period it is desirable that the temperature of the curing chamber should not fall below 100 deg. F. When the outside temperature is never below 50 deg. F. the products should be steam cured at least twenty-four (24) hours and then placed in storage and kept moist for at least four days. When the outside temperature falls below 50 deg. F. the products should be steam cured at least forty-eight (48) hours.

"If cured by sprinkling, concrete products shall be kept moist for a period of at least five days in an enclosed room where the

temperature is not allowed to drop below 50 deg. F. and the average temperature is 65 deg. F. or above, after which they shall be placed in storage and kept moist an additional five days. When the outside temperature falls below 50 deg. F. the products shall be kept moist in the enclosed room for a period of ten days."

Admixtures

The use of admixtures with portland cement is not recommended but 3% of "cal" is permissible as an aid to early hardening.

The remainder of the report deals with surface finishes and the selection of special aggregates.

Operating Concrete Plants in Winter

THE matter of having sufficient stocks in readiness to supply orders is of vital importance to the manufacturer because the success of his business depends upon his ability to supply the demand at all times with the least possible delay. The manufacturer of concrete block is no exception. Many of his problems are the same as those found in the making and selling of any commodity for which the demand is seasonal.

In the spring thousands of prospective home owners are anxious to get started on the home which they have been planning during the long winter evenings. As soon as the weather opens up, their one idea is to get the new home under way and have it completed as soon as possible. Because of the advantages of concrete block as a building material, many of them have selected it for their homes. They get in touch with the concrete block manufacturers in the locality and find that it will be impossible to obtain any block before the middle of the summer, due to the rush of orders. What is the result? Rather than postpone building until they can get the block they choose some other material which can be delivered immediately.

To correct this situation, stocks must be so increased that the concrete block manufacturers can give immediate service, and this can be done by operating during the

winter months—it can be done economically.

The additional expenses incidental to winter operation are of small consequence since overhead charges such as salaries, taxes, insurance, interest on invested capital, office and other general expenses are spread over a 12 months' period instead of possibly eight or nine months. Overhead costs per working day or per unit are reduced proportionately. While some additional capital is required to build up a surplus in preparation for early spring deliveries, the interest on this investment is overcome by increased profits due to enlarged volume of business. Twelve months' operation means twelve months' profit.

Concrete block manufacturers can do a great deal in promoting their product by taking architects, engineers, contractors, and prospective builders out to their plants during the winter and showing them how the block are made, cured, and stored. In no better way can they convince their prospective customers of the merits of their product and their ability to fill orders on short notice.

It is estimated that \$4,500,000,000 will be spent for buildings in 1925. Those manufacturers who have continued operations the past winter will get their share of this business, but those who have closed down will see orders going to competitors because of their inability to meet the demand.



Winter-made blocks ready for spring delivery



Readiness for spring deliveries means orders

The Rock Products Market

Wholesale Prices of Crushed Stone

Prices given are per ton, F. O. B., at producing plant or nearest shipping point

Crushed Limestone

| City or shipping point | Screenings, ¾ inch down | ½ inch and less | ¾ inch and less | 1½ inch and less | 2½ inch and less | 3 inch and larger |
|--|-------------------------------|--------------------|----------------------------|---------------------|---------------------|----------------------|
| EASTERN: | | | | | | |
| Buffalo, N. Y. | | | 1.30 per net ton all sizes | | | |
| Chaumont, N. Y. | 1.00 | | 1.75 | 1.50 | 1.50 | 1.50 |
| Eastern Pennsylvania | 1.35 | 1.35 | 1.45 | 1.35 | 1.35 | 1.35 |
| Munns, N. Y. | 1.00 | 1.40 | 1.40 | 1.25 | 1.25 | |
| Northern New Jersey | | | 1.60 | | | |
| Prospect, N. Y. | 1.00 | 1.40 | 1.40 | 1.30 | 1.30 | |
| Walford, Penn. | | | 1.35 | 1.50 | 1.60 | 1.60 |
| Watertown, N. Y. | .50 | | 1.75 | 1.50 | 1.50 | 1.50 |
| Western New York | 1.15 | 1.20 | 1.20 | 1.20 | 1.15 | 1.15 |
| CENTRAL | | | | | | |
| Alton, Ill. | 1.75 | | 1.75 | | | |
| Bloomville, Middlepoint, Dunkirk, Bellevue, Waterville, No. Baltimore, Holland, Kenton, New Paris, Ohio; Monroe, Mich.; Huntington, Bluffton, Ind. | 1.00 | 1.10 | 1.10 | 1.00 | 1.00 | 1.00 |
| Buffalo, Iowa | 1.10 | | 1.45 | 1.25 | 1.30 | 1.30 |
| Chicago, Ill. | .80 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Columbia, Krause, Valmeyer, Ill. | 1.15 | 1.20 | 1.20 | 1.20 | 1.10 | 1.10 |
| Cypress, Ill. | 1.20 | 1.20 | 1.15 | 1.20 | 1.25 | 1.25 |
| Dundas, Ont. | .75 | 1.00 | 1.00 | .90 | .90 | .90 |
| Greencastle, Ind. | 1.30 | 1.25 | 1.05 | .95 | .95 | .95 |
| Lannon, Wis. | .80 | 1.00 | 1.10 | .90 | .90 | .90 |
| Linwood, Iowa | 1.00 | 1.25 | 1.25 | 1.05 | 1.05 | 1.15 |
| Northern New Jersey | 1.30 | | 1.80 | 1.60 | 1.40 | |
| St. Vincent de Paul, P. Q. | 1.00 | 1.45 | 1.10 | 1.00 | .95 | |
| Stone City, Iowa | .75 | | 1.20† | 1.10 | 1.05 | |
| Waukesha, Wis. | .90 | .90 | .90 | .90 | .90 | .90 |
| Wisconsin Points | .50@1.50 | | 1.10 | 1.00 | 1.00 | |
| Youngstown, Ohio | | | | 1.50 | 1.60 | 1.60 |
| SOUTHERN: | | | | | | |
| Alderson, W. Va. | .60 | 1.60 | 1.60 | 1.50 | 1.40 | |
| Bridgeport, Texas | 1.00 | 1.00@1.35 | 1.35 | 1.25 | 1.25 | 1.10 |
| Cartersville, Ga. | 2.70 | 1.50 | 1.50 | 1.35 | 1.35 | 1.35 |
| El Paso, Texas | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | |
| Ft. Springs, W. Va. | .60 | 1.60 | 1.60 | 1.50 | 1.40 | |
| Graysville, Ga. | 1.00 | | .85@1.10 | .85@1.00 | .85@1.00 | |
| WESTERN: | | | | | | |
| Atchison, Kans. | .25 | 2.00 | 2.00 | 2.00 | 2.00 | 1.60@1.80 |
| Blue Spr'gs & Wymore, Neb. | .20 | 1.45 | 1.45 | 1.35@1.40 | 1.25@1.30 | 1.20 |
| Cape Girardeau, Mo. | 1.25 | | 1.25 | 1.25 | 1.00 | |
| Kansas City, Mo. | 1.00 | 1.65 | 1.65 | 1.65 | 1.65 | 1.65 |

Crushed Trap Rock

| City or shipping point | Screenings, ¾ inch down | ½ inch and less | ¾ inch and less | 1½ inch and less | 2½ inch and less | 3 inch and larger |
|---|-------------------------------|--------------------|--------------------|---------------------|---------------------|----------------------|
| Branford, Conn. | .60 | 1.70 | 1.45 | 1.20 | 1.05 | |
| Duluth, Minn. | 1.00 | 2.25 | 1.75 | 1.50 | 1.30 | 1.30 |
| Dwight, Calif. | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | |
| Eastern Maryland | 1.00 | 1.60 | 1.60 | 1.50 | 1.35 | 1.35 |
| Eastern Massachusetts | .85 | 1.75 | 1.75 | 1.25 | 1.25 | 1.25 |
| Eastern New York | .75 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Eastern Pennsylvania | 1.15 | 1.60 | 1.60 | 1.50 | 1.35 | 1.35 |
| Minneapolis, Minn. | 1.25 | | 2.25 | 2.00 | 1.75 | |
| New Haven, Wallingford and Britain, Conn. | .60 | 1.70 | 1.45 | 1.20 | 1.05 | 1.05 |
| Northern New Jersey | 1.60 | 2.20 | 2.00 | 1.60 | 1.60 | |
| Oakland and El Cerrito, Calif. | 1.75 | 1.75 | 1.75 | 1.75 | 1.75 | |
| San Diego, Calif. | .50@ .75 | 1.80@1.90 | 1.60@1.80 | 1.35@1.55 | 1.35@1.55 | 1.25@1.45 |
| Sheboygan, Wis. | 1.00 | 1.10 | 1.10 | 1.10 | 1.10 | |
| Springfield, N. J. | 1.70 | 2.00 | 2.00 | 1.70 | 1.70 | |
| Westfield, Mass. | .60 | 1.50 | 1.35 | 1.20 | 1.10 | 1.10 |

Miscellaneous Crushed Stone

| City or shipping point | Screenings, ¾ inch down | ½ inch and less | ¾ inch and less | 1½ inch and less | 2½ inch and less | 3 inch and larger |
|-------------------------------------|-------------------------------|--------------------|--------------------|---------------------|---------------------|----------------------|
| Berlin, Utley and Red Granite, Wis. | 1.60 | 1.70 | 1.60 | 1.50 | 1.40 | |
| Columbia, S. C.—Granite | 1.50b | | 2.00 | 1.75 | 1.60 | |
| Eastern Penn.—Sandstone | 1.30 | 1.55 | 1.50 | 1.50 | 1.30 | 1.30 |
| Eastern Penn.—Quartzite | 1.20 | 1.35 | 1.25 | 1.20 | 1.20 | 1.20 |
| Lithonia, Ga.—Granite | .75(c) | 1.50 | 1.50 | 1.25 | 1.10 | |
| Lohrville, Wis.—Granite | 1.65 | 1.70 | 1.65 | 1.45 | 1.50 | |
| Middlebrook, Mo.—Granite | 3.00@3.50 | | 2.00@2.25 | 2.00@2.25 | | 1.25@2.00 |
| Northern New Jersey (Basalt) | .150 | 2.00 | 1.80 | 1.40 | 1.40 | |
| Richmond, Calif. (Basalt) | .75* | | 1.50* | 1.50* | 1.50* | |

*Cubic yd. †1 in. and less. ‡Rip rap per ton; (b) dust out; (c) sand.

Agricultural Limestone (Pulverized)

| | |
|--|--------------|
| Alton, Ill.—Analysis, 98% CaCO ₃ ; 90% thru 100 mesh | 6.00 |
| Asheville, N. C.—Analysis, 57% CaCO ₃ , 39% MgCO ₃ ; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk | 2.75 |
| Branchton, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers) | 5.00 |
| Cartersville, Ga.—Analysis, 68% CaCO ₃ , 32% MgCO ₃ ; pulverized—90% thru 4 mesh | 2.50 1.50 |
| Chaumont, N. Y.—Pulverized limestone, bags, 4.00; bulk | 2.50 |
| Colton, Calif.—Analysis, 95% CaCO ₃ , 3% MgCO ₃ —all thru 20 mesh—bulk | 4.00 |
| Dundas, Ont., Can.—Analysis, 53.80% CaCO ₃ , 43.31% MgCO ₃ ; 35% thru 100 mesh, 50% thru 50 mesh, 100% thru 10 mesh; bags, 4.75; bulk | 3.00 |
| Hillsville, Penn.—Analysis, 94% CaCO ₃ , 1.40% MgCO ₃ , 75% thru 100 mesh; sacks, \$5.00; bulk | 3.50 |
| Jamesville, N. Y.—Analysis, 89.25% CaCO ₃ , 5.25% MgCO ₃ ; pulverized, bags, 4.00; bulk | 2.50 |
| Knoxville, Tenn.—80% thru 100 mesh, bags, 3.95; bulk | 2.70 |
| Linville Falls, N. C.—Analysis, 57% CaCO ₃ , 39% MgCO ₃ ; 50% thru 100 mesh; 200-lb. burlap bag, 4.00; bulk | 2.75 |
| Marblehead, Ohio—Analysis, 83.54% CaCO ₃ , 14.92% MgCO ₃ ; 60% thru 100 mesh; 70% thru 50 mesh; 100% thru 10 mesh; 80 lb. paper sacks, 5.10; bulk | 3.60 |
| Marion, Va.—Analysis, 90% CaCO ₃ , 2% MgCO ₃ ; 42.5% thru 100 mesh, 11.3% thru 80, 20.2% thru 60, 22.8% thru 40, 3.2% thru 20 and under or 75% thru 40 mesh; pulverized, per ton | 2.00 |
| Mayville, Wis.—Analysis, 54% CaCO ₃ , 44% MgCO ₃ ; 90% thru 100 mesh | 3.90@ 4.50 |
| Mountville, Va.—Analysis, 76.60% CaCO ₃ , 22.83% MgCO ₃ ; 50% thru 100 mesh, 100% thru 20 mesh—125-lb. hemp bags | 5.00 |
| Osborne, Penn.—100% thru 20 mesh; 60% thru 100 mesh; 45% thru 200 mesh. (Less 50 cents commission to dealers) | 5.00 |
| Piqua, Ohio—Total neutralizing power 95.3%; 99% thru 10, 60% thru 50; 50% thru 100 | 2.50@ 2.75 |
| 100% thru 10, 90% thru 50, 80% thru 100; bags, 5.10; bulk | 3.60 |
| 99% thru 100, 85% thru 200; bags, 7.00; bulk | 5.50 |
| Rockdale, Mass.—Analysis, 90% CaCO ₃ —50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk | 3.25 |
| Watertown, N. Y.—Analysis, 96-99% CaCO ₃ ; bags, 4.00; bulk | 2.50 |
| West Stockbridge, Mass.—Analysis, 90% CaCO ₃ —50% thru 100 mesh; paper bags, 4.75; cloth, 5.25; bulk | 3.25 |

Agricultural Limestone (Crushed)

| | |
|--|------|
| Alderson, W. Va.—Analysis, 90% CaCO ₃ ; 90% thru 50 mesh | 1.50 |
| Alton, Ill.—Analysis, 98% CaCO ₃ ; 50% thru 4 mesh | 1.75 |
| Bedford, Ind.—Analysis, 98½% CaCO ₃ , ½% MgCO ₃ ; 90% thru 10 mesh | 1.50 |
| Bettendorf, Iowa—97% CaCO ₃ , 2% MgCO ₃ ; 50% thru 100 mesh; 50% thru 4 mesh | 1.50 |
| Blackwater, Mo.—77% CaCO ₃ ; 100% thru 8 mesh, 25% thru 100 mesh | 1.00 |
| Bridgeport and Chico, Texas—Analysis, 94% CaCO ₃ , 2% MgCO ₃ ; 100% thru 10 mesh | 1.75 |
| 50% thru 4 mesh | 1.50 |
| Cape Girardeau, Mo.—Analysis, 93.5% CaCO ₃ , 3.5% MgCO ₃ ; 50% thru 100 mesh | 1.50 |

(Continued on next page)

Agricultural Limestone

(Continued from preceding page)

| | |
|--|------------|
| Chicago, Ill.—50% thru 100 mesh; 90% thru 4 mesh..... | .80 |
| Columbia, Krause, Valmeyer, Ill.—Analysis, 90% CaCO ₃ ; 90% thru 4 mesh..... | 1.15 |
| Cypress, Ill.—50% thru 100 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh..... | 1.25 |
| Ft. Springs, W. Va.—Analysis, 90% CaCO ₃ ; 90% thru 50 mesh..... | 1.15 |
| Kansas City, Mo.—50% thru 100 mesh..... | 1.50 |
| Lannon, Wis.—Analysis, 54% CaCO ₃ , 44% MgCO ₃ ; 99% through 10 mesh; 46% through 60 mesh..... | 1.25 |
| Screenings (¾ in. to dust)..... | 2.00 |
| Marblehead, Ohio.—Analysis, 83.54% CaCO ₃ , 14.92% MgCO ₃ , 32% thru 100 mesh; 51% thru 50 mesh; 83% thru 10 mesh; 100% thru 4 mesh (meal) bulk..... | 1.00 |
| Mayville, Wis.—Analysis, 54% CaCO ₃ , 44% MgCO ₃ ; 50% thru 50 mesh..... | 1.60 |
| Middlepoint, Bellevue, Kenton, Ohio; Monroe, Mich.; Huntington and Bluffton, Ind.—Analysis, 42% CaCO ₃ , 54% MgCO ₃ ; meal, 25 to 45% thru 100 mesh..... | 1.85@ 2.35 |
| Milltown, Ind.—Analysis, 94.41% CaCO ₃ , 2.95% MgCO ₃ ; 30.8% thru 100 mesh; 38% thru 50 mesh..... | 1.60 |
| Moline, Ill.—97% CaCO ₃ , 2% MgCO ₃ —50% thru 100 mesh; 50% thru 4 mesh..... | 1.45@ 1.60 |
| Pixley, Mo.—Analysis, 96% CaCO ₃ ; 50% thru 50 mesh; 90% thru 50 mesh; 50% thru 50 mesh; 90% thru 4 mesh; 50% thru 4 mesh..... | 1.50 |
| River Rouge, Mich.—Analysis, 54% CaCO ₃ , 40% MgCO ₃ ; bulk..... | 1.25 |
| Stone City, Iowa.—Analysis, 98% CaCO ₃ ; 50% thru 50 mesh..... | 1.65 |
| Waukesha, Wis.—Test, 107.38% bone dry, 100% thru 10 mesh; bags, 2.85; bulk..... | .80@ 1.40 |
| | .75 |
| | 2.10 |

Pulverized Limestone for Coal Operators

| | |
|---|------------|
| Hillsville, Penn., sacks, 4.50; bulk..... | 3.00 |
| Piqua, Ohio, sacks, 4.50@5.00 bulk .. | 3.00@ 3.50 |
| Waukesha, Wis.—Bulk..... | 4.00 |

Miscellaneous Sands

Silica sand is quoted washed, dried and screened unless otherwise stated. Prices per ton.

| | |
|--|------------|
| Glass Sand: | |
| Berkeley Springs, W. Va..... | 2.00@ 2.25 |
| Cedarville and S. Vineland, N. J.—Damp..... | 1.75 |
| Dry..... | 2.25 |
| Cheshire, Mass: | |
| 6.00 to 7.00, per ton; bbl..... | 2.50 |
| Columbus, Ohio..... | 1.25@ 1.50 |
| Estill Springs and Sewanee, Tenn..... | 1.50 |
| Grays Summit and Klondike, Mo..... | 2.00 |
| Los Angeles, Calif.—Washed..... | 5.00 |
| Mapleton Depot, Penn..... | 2.00@ 2.25 |
| Massillon, Ohio..... | 3.00 |
| Ohton, Ohio..... | 2.50 |
| Ottawa, Ill.—Chemical and mesh guaranteed..... | 1.50 |
| At market..... | 1.00 |
| Pacific, Mo..... | 2.25@ 3.00 |
| Pittsburgh, Penn.—Dry..... | 4.00 |
| Damp..... | 3.00 |
| Red Wing, Minn.: | |
| Bank run..... | 1.50 |
| Ridgway, Penn..... | 2.50 |
| Rockwood, Mich..... | 2.75@ 3.25 |
| Round Top, Md..... | 2.25 |
| San Francisco, Calif..... | 4.00@ 5.00 |
| St. Louis, Mo..... | 2.00 |
| Sewanee, Tenn..... | 1.50 |
| Thayers, Penn..... | 2.50 |
| Zanesville, Ohio..... | 2.50 |
| Miscellaneous Sands: | |
| Aetna, Ind.: | |
| Core, Box cars, net, .35; open-top cars..... | .30 |
| Albany, N. Y.: | |
| Molding fine, brass molding..... | 2.75 |
| Molding coarse..... | 2.75 |
| Sand blast..... | 4.50 |
| Arenzville and Tamalco, Ill.: | |
| Core..... | 1.00 |
| Molding coarse..... | 1.50 |
| Molding fine..... | 1.50@ 1.75 |
| Brass molding..... | 2.00 |
| Beach City, Ohio: | |
| Fine core..... | 1.75 |
| Furnace bottom..... | 2.50 |

(Continued on next page)

Wholesale Prices of Sand and Gravel

Prices given are per ton, f. o. b. producing plant or nearest shipping point

Washed Sand and Gravel

| City or shipping point | Fine Sand, 1/10 in. down | Sand, ¼ in. and less | Gravel, ½ in. and less | Gravel, 1 in. and less | Gravel, 1½ in. and less | Gravel, 2 in. and less |
|--|--------------------------|----------------------|------------------------|------------------------|-------------------------|------------------------|
| EASTERN: | | | | | | |
| Ambridge & So. H'g'ts, Penn. | 1.25 | 1.25 | 1.15 | .85 | .85 | .85 |
| Buffalo, N. Y..... | 1.10 | .95 | .85 | | | |
| Eric, Penn..... | | 1.00 | | 1.10 | 1.25 | |
| Farmingdale, N. J..... | .58 | .48 | 1.05 | 1.20 | 1.10 | |
| Leeds Jct., Maine..... | | .50 | 1.75 | | 1.35 | 1.25 |
| Machias Jct., N. Y..... | | .75 | .75 | .75 | .75 | .75 |
| Montoursville, Penn..... | 1.00 | 1.10 | 1.00 | 1.00 | 1.00 | .90 |
| Northern New Jersey..... | | .40@ .80 | 1.25 | 1.50 | 1.50 | |
| Pittsburgh, Penn., and vicinity | 1.25 | 1.25 | 1.05 | 1.05 | .85 | .85 |
| Shining Point, Penn..... | | | 1.00 | 1.00 | 1.00 | 1.00 |
| Washington, D. C.—Rewashed, river..... | .85 | .85 | 1.70 | 1.50 | 1.30 | 1.30 |
| CENTRAL: | | | | | | |
| Attica, Ind..... | .75 | .75 | .75 | .75 | .75 | .75 |
| Barton, Wis..... | | .60 | .80 | .80 | .80 | |
| Columbus, Ohio..... | .75 | .75@ 1.00 | .75 | .75@ 1.00 | .75@ 1.00 | .75@ 1.00 |
| Covington, Ind..... | .75 | .75 | .75 | .75 | .75 | .75 |
| Des Moines, Iowa..... | .50 | .30 | 1.50 | 1.50 | 1.50 | 1.50 |
| Eau Claire, Wis..... | .40 | .40 | .85@ 1.25 | | | .85 |
| Elkhart Lake, Wis..... | .65 | .60 | .62 | .62 | .62 | .62 |
| Ft. Dodge, Iowa..... | 1.00 | | 2.05 | 2.05 | 2.05 | |
| Ft. Worth, Texas..... | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 | 2.00 |
| Grand Rapids, Mich..... | | .60 | | .90 | .80 | .80 |
| Hamilton, Ohio..... | | 1.00 | | | 1.00 | |
| Hersey, Mich..... | | .50 | | | | .70 |
| Indianapolis, Ind..... | .60 | .60 | | .90 | .75@ 1.00 | .75@ 1.00 |
| Janesville, Wis..... | | .65@ .75 | 1.35@ 1.45 | 1.45@ 1.55 | .65@ .75 | 1.35@ 1.45 |
| Mason City, Iowa..... | .45@ .55 | .45@ .55 | 1.25a | | 1.40@ 1.50 | |
| Mankato, Minn..... | | .40 | 1.25a | | 1.25 | |
| Milwaukee, Wis..... | | 1.01 | 1.21 | 1.21 | 1.21 | 1.21 |
| Minneapolis, Minn.*..... | .35 | .35 | 1.35 | 1.25 | 1.25 | 1.25 |
| Northern New Jersey..... | .45@ .50 | .45@ .50 | | 1.25 | 1.25 | |
| Palestine, Ill..... | .75 | .75 | .75 | .75 | .75 | .75 |
| St. Louis, Mo., f. o. b. cars..... | 1.18 | 1.45 | 1.65 | 1.45 | | 1.45 |
| Silverwood, Ind..... | .75 | .75 | .75 | .75 | .75 | .75 |
| Summit Grove, Ind..... | .75 | .75 | .75 | .75 | .75 | .75 |
| Terre Haute, Ind..... | .75 | .60 | .90 | .90 | .90 | .85 |
| Wolcottville, Ind..... | .75 | .75 | .75 | .75 | .75 | .75 |
| Waukesha, Wis..... | | .45 | .55 | .60 | .65 | .65 |
| Winona, Minn..... | .40 | .40 | 1.25 | 1.10 | 1.00 | 1.00 |
| Yorkville, Sheridan, Oregon, Moronts, Ill..... | | | | | | |
| Zanesville, Ohio..... | .70 | .60 | Average .40@ .60 | .60 | .90 | |
| SOUTHERN: | | | | | | |
| Brookhaven, Miss., Roseland La..... | 1.75* | .70 | 2.25 | 1.50 | 1.25 | |
| Charleston, W. Va..... | All sand | 1.40 f.o.b. cars | | All gravel | 1.50 f.o.b. cars | |
| Chehaw, Ala..... | 1.24 | 1.24 | | 1.90 | 1.90 | 1.90 |
| Estill Sp'gs & Sewanee, Tenn..... | 1.00 | .90 | 1.00 | 1.00 | .85 | .85 |
| Knoxville, Tenn..... | 1.00 | 1.00 | 1.20 | 1.20 | 1.20 | 1.20 |
| Macon, Ga..... | .50 | .50 | | | .65 | .65 |
| New Martinsville, W. Va..... | | .90 | | 1.30 | .90 | .90 |
| Smithville, Texas..... | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| WESTERN: | | | | | | |
| Baldwin Park, Calif..... | .25@ .35 | | | | .50@ .75 | |
| Crushed rock..... | .90@ 1.10 | .60@ .90 | .60@ .90 | .60@ .90 | .60@ .90 | |
| Kansas City, Mo..... | .80 | .70 | | | | |
| Los Angeles, Calif..... | | .40 | .50 | .65 | .60 | .60 |
| Pueblo, Colo..... | 1.10* | .90* | | 1.60* | | 1.50* |
| San Diego, Calif..... | .50 | .50 | 1.20 | 1.20 | 1.00 | 1.00 |
| Seattle, Wash. (bunkers)..... | 1.50* | 1.50* | 1.50* | 1.50* | 1.50* | 1.50* |

Bank Run Sand and Gravel

| City or shipping point | Fine Sand, 1/10 in. down | Sand, ¼ in. and less | Gravel, ½ in. and less | Gravel, 1 in. and less | Gravel, 1½ in. and less | Gravel, 2 in. and less |
|---|--------------------------|----------------------|------------------------|------------------------|-------------------------|------------------------|
| Boonville, N. Y..... | .60@ .80 | | .55@ .75 | | | 1.00 |
| Brookhaven, Miss., Rosel'd, La..... | 00@ .30 | | | | | |
| Chehaw, Ala..... | | | | | | |
| Des Moines, Iowa..... | | | | | | |
| Dudley, Ky..... | 1.15 | | | .95 | | |
| East Hartford, Conn..... | | | | | | |
| Elkhart Lake, Wis..... | .50 | | | | | |
| Gainesville, Texas..... | | .95 | | | | .55 |
| Grand Rapids, Mich..... | | | | .55 | | |
| Hamilton, Ohio..... | | | | .70 | | |
| Hersey, Mich..... | | | | .55 | | |
| Indianapolis, Ind..... | | | | | | |
| Lindsay, Texas..... | | | | | | .55 |
| Macon, Ga..... | | .35 | | | | |
| Mankato, Minn..... | | | | | | |
| Moline, Ill. (b)..... | .60 | .60 | | | | |
| Montezuma, Ind..... | | | | | | |
| St. Louis, Mo..... | | | | | | |
| Shining Point, Penn..... | .50 | .50 | .50 | .50 | .50 | .50 |
| Smithville, Texas..... | .50 | .50 | .50 | .50 | .50 | .50 |
| Summit Grove, Ind..... | .60 | .60 | .60 | .60 | .60 | .60 |
| Waukesha, Wis..... | .60 | .60 | .60 | .60 | .60 | .60 |
| Winona, Minn..... | .60 | .60 | .60 | .60 | .60 | .60 |
| York, Penn..... | 1.10 | | | | | |
| Zanesville, Ohio..... | | .60 | | | | |
| Road gravel, ballast gravel, .60 a ton | | | | | | |
| Washed, .50; unwashed, .40 (not screened) | | | | | | |
| Sand, .65 per cu. yd. | | | | | | |
| Mixed gravel for concrete work, .65 | | | | | | |
| Pit run gravel, .50 | | | | | | |
| Concrete gravel, 50% G., 50% S., 1.00 | | | | | | |
| Mine run gravel 1.55 per ton | | | | | | |
| Concrete sand, 1.10 ton | | | | | | |

*Cubic yd.; (a) ¼ in. and less; (b) river run.

Miscellaneous Sands

(Continued from preceding page)

| | |
|---|-------------|
| Molding fine and coarse..... | 2.00 |
| Traction unwashed and screened..... | 1.75 |
| Cheshire, Mass.—Furnace lining, molding fine and coarse..... | 5.00 |
| Sand blast..... | 5.00@ 8.00 |
| Stone sawing..... | 6.00 |
| Columbus, Ohio: | |
| Core..... | .30@ .50 |
| Furnace lining, molding coarse..... | 2.00@ 2.25 |
| Molding fine..... | 2.50@ 2.75 |
| Sand blast..... | 4.00@ 4.50 |
| Stone sawing..... | 1.50 |
| Traction..... | .50@ .75 |
| Brass molding..... | 2.50@ 3.00 |
| Dresden, Ohio: | |
| Core..... | 1.25@ 1.50 |
| Molding fine..... | 1.50@ 1.75 |
| Molding coarse..... | 1.50 |
| Traction..... | 1.25 |
| Brass molding..... | 1.75 |
| Dunbar, Penn.:..... | |
| Traction (damp)..... | 2.00 |
| Eau Claire, Wis.:..... | |
| Sand blast..... | 3.00@ 3.25 |
| Elco, Ill.:..... | |
| Ground silica per ton in carloads..... | 22.00@31.00 |
| Estill Springs and Sewanee, Tenn.:..... | |
| Molding fine and coarse..... | 1.25 |
| Roofing sand, sand blast, traction..... | 1.35@ 1.50 |
| Franklin, Penn.:..... | |
| Core..... | 2.00 |
| Molding coarse and fine..... | 1.75 |
| Grays Summit, Mo.:..... | |
| Molding fine..... | 1.75@ 2.00 |
| Joliet, Ill.:..... | |
| No. 2 molding sand; also loam for luting purposes and open-hearth work..... | .65@ .85 |
| Klondike, Mo.:..... | |
| Molding fine..... | 1.75@ 2.00 |
| Mapleton Depot, Penn.:..... | |
| Molding fine, traction and blast..... | 2.00 |
| Roofing sand..... | 2.25 |
| Massillon, Ohio: | |
| Molding fine, coarse, furnace lining | |

| | |
|---|------------|
| core and traction..... | 2.50 |
| Montoursville, Penn.:..... | |
| Core..... | 1.25@ 1.35 |
| Traction..... | 1.00 |
| Brass molding..... | 1.50 |
| New Lexington, Ohio: | |
| Molding fine..... | 2.50 |
| Molding coarse..... | 2.25 |
| Ohlton, Ohio: | |
| Core, furnace lining, molding fine and coarse, all green..... | 2.00 |
| Roofing sand, sand blast, stone sawing traction, all green..... | 1.85 |
| Add 50c a ton for green sand dried. | |
| Oceanside, Calif.:..... | |
| Roofing sand (stucco)..... | 3.00@ 3.40 |
| Ottawa, Ill.:..... | |
| Crude silica sand..... | 1.00@ 1.25 |
| Core, furnace lining..... | 1.25 |
| Roofing sand, brass molding..... | 1.25@ 2.50 |
| Sand blast, stone sawing..... | 4.00 |
| Traction..... | 1.00 |
| Pacific, Mo.:..... | |
| Core, furnace lining..... | 1.00@ 1.25 |
| Molding fine..... | .90@ 1.00 |
| Stone sawing..... | 1.00@ 1.75 |
| Molding coarse..... | .85@ 1.00 |
| Red Wing, Minn.:..... | |
| Core, furnace lining, stone sawing..... | 1.50 |
| Molding fine and coarse, traction..... | 1.25 |
| Sand blast..... | 3.50 |
| Filter sand..... | 3.75 |
| Ridgway, Penn.:..... | |
| Core..... | 2.00 |
| Furnace lining, molding fine, molding coarse..... | 1.25 |
| Traction..... | 2.25 |
| Round Top, Md.:..... | |
| Core..... | 1.60 |
| Traction, damp..... | 1.75 |
| Roofing and blast sand..... | 2.25 |
| St. Louis, Mo.:..... | |
| Core..... | 1.00@ 1.75 |
| Furnace lining..... | 1.50 |
| Molding fine..... | 1.50@ 2.50 |

Crushed Slag

| City or shipping point | Roofing | 1/4 in. down | 1/4 in. and less | 1/2 in. and less | 1 1/2 in. and less | 2 1/2 in. and less | 3 in. and larger |
|-------------------------------------|-----------|--------------|------------------|------------------|--------------------|--------------------|------------------|
| EASTERN: | | | | | | | |
| Buffalo, N. Y..... | 2.25@2.35 | 1.25@1.35 | 1.25@1.35 | 1.25@1.35 | 1.25@1.35 | 1.25@1.35 | 1.25@1.35 |
| E. Canaan, Conn..... | 3.00 | 1.00 | 2.25 | 1.25 | 1.25 | 1.15 | 1.15 |
| CENTRAL: | | | | | | | |
| Northern N. J..... | 2.50 | 1.20 | 1.50 | 1.20 | 1.20 | 1.20 | 1.20 |
| Reading, Pa..... | 2.50 | 1.00 | 1.50 | 1.25 | 1.25 | 1.25 | 1.25 |
| Western Penn..... | 2.50 | 1.25 | 1.50 | 1.25 | 1.25 | 1.25 | 1.25 |
| SOUTHERN: | | | | | | | |
| Ironton, Ohio..... | 2.05 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 | 1.45 |
| Jackson, Ohio..... | 1.50 | 1.05 | 1.30 | 1.05 | 1.05 | 1.30 | 1.30 |
| Toledo, Ohio..... | 1.50 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 | 1.25 |
| Youngst'n, O., dist..... | 2.00 | 1.25 | 1.35 | 1.35 | 1.25 | 1.25 | 1.25 |
| SOUTHERN: | | | | | | | |
| Ashland, Ky..... | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 | 1.55 |
| Ensley and Alabama City, Ala..... | 2.05 | .80 | 1.25 | 1.15 | .90 | .90 | .80 |
| Longdale, Roanoke, Ruesens, Va..... | 2.50 | 1.00 | 1.25 | 1.25 | 1.25 | 1.15 | 1.15 |

Lime Products (Carload Prices Per Ton F.O.B. Shipping Point)

| | Finishing hydrate | Masons' hydrate | Agricultural hydrate | Chemical hydrate | Ground burnt lime, Blk. Bags | Lump lime, Blk. Bbl. |
|------------------------------|-------------------|-----------------|----------------------|------------------|------------------------------|----------------------|
| EASTERN: | | | | | | |
| Berkeley, R. I..... | | | 12.00 | | | 2.20 |
| Buffalo, N. Y..... | | 10.00 | 9.00 | 12.00 | | |
| Lime Ridge, Penn..... | | | | | 5.00a | |
| Williamsport, Penn..... | | | 10.00 | | 6.00 | |
| York, Penn..... | | 10.50 | 10.50 | 11.50 | | 8.50 1.65i |
| CENTRAL: | | | | | | |
| Cold Springs, Ohio..... | | 9.00 | 9.00 | | 9.00 11.00 | |
| Delaware, Ohio..... | 12.50 | 10.00 | 9.00 | 10.50 | | 9.00 1.50 |
| Gibsonburg, Ohio..... | 12.50 | | | | | |
| Huntington, Ind..... | 12.50 | 10.00 | 9.00 | | 9.00 11.00 | 9.00 |
| Luckey, Ohio (f)..... | 12.50 | | | | | |
| Marblehead, Ohio..... | | 10.00 | 9.00 | 12.00 | | 9.00 1.50c |
| Marion, Ohio..... | | 10.00 | 9.00 | | | 9.00 1.50c |
| Mitchell, Ind..... | | 12.00 | 12.00 | 12.00 11.00 | | 10.00 1.70e |
| Sheboygan, Wis..... | | | | | | 9.50 |
| Tiffin, Ohio..... | | 10.00 | | | | |
| White Rock, Ohio..... | 12.50 | | | | 9.00 11.00 | 9.00 1.50c |
| Woodville, Ohio..... | 12.50f | 10.00f | 9.00f | | 9.00 10.50f | 9.00 1.50f |
| SOUTHERN: | | | | | | |
| Erin, Tenn..... | | | | | | 7.80 1.25 |
| El Paso, Texas..... | 23.50 | | | | | 10.50 1.75 |
| Graystone & Wilmay, Ala..... | 12.50 | 11.00 | | 11.00 | | 8.50 1.50 |
| Karo, Va..... | | 10.00 | 9.00 | | | 7.00g 1.65h |
| Knoxville, Tenn..... | 20.00 | 11.00 | | 11.00 | 1.35 | 8.50 1.50 |
| Varnons, Ala. (f)..... | 11.00p | 11.00p | | | 9.00 .90 | 8.50q 1.50r |
| Zuber and Ocala, Fla..... | 14.00 | 12.00 | 10.00 | | | 12.00 1.70 |
| WESTERN: | | | | | | |
| Kirtland, N. M..... | | | | | | 15.00 |
| San Francisco, Calif..... | 31.00 | 21.00 | 16.00 | 21.00 | | 16.00 2.00 |
| Tehachapi, Calif..... | | | | | | 16.20 |

†50-lb. paper bags; (a) run of kilns; (c) wooden, steel 1.70; (d) wood; (e) wood bbl., \$2.20 drum in steel; (f) dealers' prices; (g) to 9.50; (h) to 1.75; (i) 200 lb. bbl.; 2.65, 300 lb. bbl.; (l) bags; (m) finishing lime, 2.50 common; (n) common lime; (p) to 11.00; (q) to 8.50; (r) to 1.50.

Miscellaneous Sands

(Continued)

| | |
|---|-------------|
| Molding coarse..... | 1.25@ 1.75 |
| Roofing sand..... | 1.75 |
| Sand blast..... | 3.50@ 4.50 |
| Stone sawing..... | 1.25@ 2.25 |
| Traction..... | 1.25 |
| Brass molding..... | 2.00@ 3.00 |
| San Francisco, Calif.:..... | |
| (Washed and dried)—Core, molding fine, roofing sand and brass molding..... | 3.00@ 3.50 |
| San Francisco, Calif. (Direct from Pit)..... | |
| Furnace lining, molding coarse, sand blast..... | 3.60 |
| Stone sawing, traction..... | 2.30 |
| Sewanee, Tenn.:..... | |
| Molding fine and coarse, roofing sand, sand blast, stone sawing, traction, brass molding..... | 1.25 |
| Tamms, Ill.:..... | |
| Ground silica per ton in carloads..... | 20.00@31.00 |
| Thayers, Penn.:..... | |
| Core..... | 2.00 |
| Molding fine and coarse..... | 1.25 |
| Traction..... | 2.25 |
| Utica, Ill.:..... | |
| Furnace lining..... | .75@ 1.00 |
| Molding fine..... | .75 |
| Molding coarse..... | .85 |
| Utica, Penn.:..... | |
| Core, molding fine, brass molding..... | 2.00 |
| Molding coarse..... | 1.75 |
| Warwick, Ohio:..... | |
| Core, molding coarse (green) 2.00; (dry) 2.50; traction..... | 2.50 |
| Zanesville, Ohio:..... | |
| Sand blast, core, traction..... | 2.00@ 3.00 |
| Furnace lining..... | 2.25 |
| Molding fine and coarse; brass molding..... | 2.00@ 2.25 |

Talc

| | |
|---|-------------|
| Prices given are per ton f.o.b. (in carload lots only), producing plant, or nearest shipping point. | |
| Baltimore, Md.:..... | |
| Crude talc (mine run)..... | 3.00@ 4.00 |
| Ground talc (20-50 mesh), bags..... | 10.00 |
| Cubes..... | 55.00 |
| Blanks (per lb.)..... | .08 |
| Pencils and steel workers' crayons, per gross..... | 1.25 |
| Chatsworth, Ga.:..... | |
| Crude (for grinding)..... | 4.00 |
| Ground (25-50 mesh) 200 lb. bags..... | 6.00 |
| Ground (150-200 mesh) 200 lb. bags..... | 10.00 |
| Chester, Vt.:..... | |
| Ground (150-200 mesh)..... | 10.00@10.50 |
| (Bags extra, returnable)..... | |
| E. Granville, Rochester, Johnson, Waterbury, Vt.:..... | |
| Ground talc (20-50 mesh) bags..... | 7.00@10.00 |
| Ground talc (150-200 mesh) bags..... | 10.00@25.00 |
| Pencils and steel workers' crayons, per gross..... | .75@ 2.00 |
| Emeryville, N. Y.:..... | |
| (Double air floated) including bags; 325 mesh (50 lb. paper, 100 & 200 lb. burlap bags)..... | 14.75 |
| Halesboro, N. Y.:..... | |
| Ground (150-200 mesh) bags..... | 18.00 |
| Ground (200-300 mesh) bags..... | 20.00 |
| Henry, Va.:..... | |
| Crude talc (mine run) per 2000-lb. ton..... | 2.75@ 3.50 |
| Ground (150-200 mesh), bags..... | 9.00@14.00 |
| Joliet, Ill.:..... | |
| Ground (200 mesh), bags..... | 30.00 |
| Marshall, N. C.:..... | |
| Crude..... | 4.00@ 8.00 |
| Ground (20-50 mesh), bags extra..... | 6.50@ 8.50 |
| Ground (150-200 mesh), bags..... | 8.00@12.00 |
| Natural Bridge, N. Y.:..... | |
| Ground talc (300-325 mesh), 200-lb. bags..... | 13.50 |
| 50-lb. bags..... | 14.00 |

Rock Phosphate

Prices given are per ton (2240-lb.) f.o.b. producing plant or nearest shipping point.

Lump Rock

| | |
|---|------------|
| Gordonsburg, Tenn.—B.P.L. 68-72%..... | 4.00@ 4.50 |
| Mt. Pleasant, Tenn.—B.P.L. 75-78%..... | 6.50@ 8.00 |
| 75% hand mined..... | 6.50 |
| 75% (free of fines for furnace use)..... | 6.75 |
| 75% max. 5 1/4% I and A..... | 6.50@ 7.00 |
| 78% max. 4 1/4% I and A..... | 8.00 |
| 75% B.P.L..... | 6.50@ 6.75 |
| Tennessee—F. O. B. mines, gross ton, unground Tenn. brown rock, 72% min. B.P.L..... | 5.50 |
| Twomey, Tenn.—B.P.L. 65%, 2000 lb. 7.00@ 8.00 | |

Ground Rock

(2000 lb.)

| | |
|---------------------------------------|------------|
| Centerville, Tenn.—B.P.L. 65%..... | 7.00 |
| Gordonsburg, Tenn.—B.P.L. 68-72%..... | 4.00@ 5.00 |
| Mt. Pleasant, Tenn.—B.P.L. 65%..... | 7.00 |
| 95% thru 100 mesh..... | 5.75 |
| B.P.L. 13%. 95% thru 80 mesh..... | 7.00@ 8.00 |
| Twomey, Tenn.—B.P.L., 65%..... | |

(Continued on next page)

Roofing Slate

The following prices are per square (100 sq. ft.) for Pennsylvania Blue-Clay Roofing Slate, f. o. b. cars quarries:

| Sizes | Genuine Bangor, Washington Big Bed, Franklin | Genuine Albion | Slatington Small Bed | Genuine Bangor Ribbon |
|---------------------------|--|----------------|----------------------|-----------------------|
| 24x12, 24x14 | 10.20 | 10.00 | 8.10 | 7.80 |
| 22x12 | 10.80 | 10.00 | 8.40 | 8.75 |
| 22x11 | 10.80 | 10.50 | 8.40 | 8.75 |
| 20x12 | 12.60 | 10.50 | 8.70 | 8.75 |
| 20x10, 18x10, 18x9, 18x12 | 12.60 | 11.00 | 8.70 | 8.75 |
| 16x10, 16x9, 16x8, 16x12 | 12.60 | 11.00 | 8.40 | 8.75 |
| 14x10 | 11.10 | 11.00 | 8.10 | 7.80 |
| 14x8 | 11.10 | 10.50 | 8.10 | 7.80 |
| 14x7 to 12x6 | 9.30 | 10.50 | 7.50 | 7.80 |
| | Mediums | Mediums | Mediums | Mediums |
| 24x12 | \$ 8.16 | \$3.10 | \$7.20 | \$5.75 |
| 22x11 | 8.40 | 8.40 | 7.50 | 5.75 |
| Other sizes | 8.70 | 8.70 | 7.80 | 5.75 |

For less than carload lots of 20 squares or under, 10% additional charge will be made.

(Continued from preceding page)

Florida Phosphate

(Raw Land Pebble)

| Per Ton | |
|---|------|
| Florida—F. O. B. mines, gross ton, 68/66% B.P.L., Basis 68% | 2.25 |
| 70% min. B.P.L., Basis 70% | 2.50 |
| 72% min. B.P.L., Basis 72% | 2.75 |
| 75/74% B.P.L., Basis 75% | 3.75 |

Fluorspar

| | |
|---|-------|
| Fluorspar—80% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines | 20.00 |
| Fluorspar—85% and over calcium fluoride, not over 5% silica; per ton f.o.b. Illinois and Kentucky mines | 21.00 |
| Fluorspar, foreign, 85% calcium fluoride, not over 5% silica, c.i.f. Philadelphia, duty paid, per gross ton | 18.00 |

Special Aggregates

Prices are per ton f. o. b. quarry or nearest shipping point.

| City or shipping point | Terrazzo | Stucco chips |
|--|-------------|--------------|
| Barton, Wis., f.o.b. cars | | 10.50 |
| Chicago, Ill.—Stucco chips, in sacks f.o.b. quarries | | 17.50 |
| Crown Point, N. Y.—Mica Spar | 8.00@10.00 | |
| Easton, Penn., and Phillipsburg, N. J.—Slate granules | 6.00@ 6.50 | |
| Royal and creme green | 15.00 | |
| Evergreen | 10.00 | |
| Haddam, Conn.—Feltstone buff | 15.00 | 15.00 |
| Harrisonburg, Va.—Blk marble (crushed, in bags) | 112.50 | 112.50 |
| Ingomar, Ohio (in bags) | | 5.00@22.00 |
| Middlebrook, Mo.—Red | | 20.00@25.00 |
| Milwaukee, Wis. | | 14.00@34.00 |
| Newark, N. J.—Roofing granules | | 7.50 |
| New York, N. Y.—Red and yellow Verona | | 32.00 |
| Poultney, Vt., 2000 lb. | | 6.12 |
| Red Granite, Wis. | | 7.50 |
| Sioux Falls, S. D. | 7.50 | 7.50 |
| Stockton, Cal.—Sized rock for roofing and stucco dashes, CL lots | | 12.00 |
| Tuckahoe, N. Y.—2000 lb. | | 12.00 |
| Villa Grove, Colo. | | 13.00 |
| Wauwatosa, Wis. | 16.00@45.00 | |
| †C.L. Less than C. L., 15.50. | | |

Concrete Brick

Prices given per 1000 brick, f.o.b. plant or nearest shipping point.

| | Common | Face |
|---|-------------|--------------|
| Appleton, Minn. | 22.00 | 25.00@35.00 |
| Baltimore, Md. (Del. according to quantity) | 16.00@17.00 | 22.00@50.00 |
| Ensley, Ala. ("Slag-tex") | 12.50 | 22.50@33.50 |
| Eugene, Ore. | 25.00 | 35.00@75.00 |
| Friesland, Wis. | 22.00 | 32.00 |
| Milwaukee, Wis. | 14.00 | 30.00@42.00 |
| Omaha, Neb. | 18.00 | 30.00@40.00 |
| Philadelphia, Penn. | 15.00 | 21.00 |
| Portland, Ore. | 19.00 | 25.00@45.00 |
| Prairie Du Chien, Wis. | 14.00 | 25.00@33.00 |
| Puyallup, Wash. | 20.00 | 30.00@90.00 |
| Rapid City, S. D. | 18.00 | 25.00@45.00 |
| Salem, Ore. | 23.00 | 90.00@100.00 |
| Watertown, N. Y. | 18.00@21.00 | 35.00@37.50 |
| Wauwatosa, Wis. | 14.00@18.00 | 30.00@42.00 |

Sand-Lime Brick

Prices given per 1000 brick f. o. b. plant or nearest shipping point, unless otherwise noted.

| | |
|---------------------------------|-------------|
| Barton, Wis. | 10.50 |
| Boston, Mass. | 14.00@15.50 |
| Brighton, N. Y. | 16.75 |
| Dayton, Ohio | 12.50@13.50 |
| Grand Rapids, Mich. (wholesale) | 10.00 |
| Jackson, Mich. | 13.00 |
| Lancaster, N. Y. | 13.00 |
| Michigan City, Ind. | 11.00 |
| Milwaukee, Wis. | 13.00 |
| Plant City, Fla. | 11.00@15.00 |
| Portage, Wis. | 15.00 |
| Saginaw, Mich. | 13.00 |
| San Antonio, Texas | 12.50@14.00 |
| Syracuse, N. Y. | 16.00@18.00 |

Gray Klinker Brick

| | |
|----------------|-------|
| El Paso, Texas | 13.00 |
|----------------|-------|

Lime

Warehouse prices, carload lots at principal cities.

| | Hydrated, per ton | Finishing, Common |
|----------------------------|-------------------|-------------------|
| Atlanta, Ga. | 22.50 | 14.00 |
| Baltimore, Md. | 24.25 | 17.85 |
| Boston, Mass. | 20.00 | 15.00 |
| Cincinnati, Ohio | 16.80 | 14.30 |
| Chicago, Ill. | 20.00 | 18.00 |
| Dallas, Tex. | 20.00 | — |
| Denver, Colo. | 24.00 | — |
| Detroit, Mich. | 16.00 | — |
| Minneapolis, Minn. (white) | 23.00 | 21.00 |
| Montreal, Que. | 21.00 | 21.00 |
| New York, N. Y. | 18.20 | 13.10 |

| | | |
|------------------------------|-------|-------|
| Philadelphia, Penn. | 23.00 | 16.00 |
| St. Louis, Mo. | 24.00 | 20.00 |
| San Francisco, Calif. | 22.00 | — |
| Seattle, Wash. (paper sacks) | 24.00 | — |

Portland Cement

Prices per bag and per bbl. without bags net in carload lots.

| | Per Bag | Per Bbl. |
|----------------------------------|---------|------------|
| Albany, N. Y. | — | 2.62 |
| Atlanta, Ga. | — | 2.35 |
| Boston, Mass. | — | 2.53@2.63 |
| Buffalo, N. Y. | .63 | 2.38@2.48† |
| Cedar Rapids, Iowa | — | 2.44 |
| Cincinnati, Ohio | — | 2.47 |
| Cleveland, Ohio | — | 2.39 |
| Chicago, Ill. | — | 2.20 |
| Columbus, Ohio | — | 2.44 |
| Dallas, Texas | .53¾ | 2.15 |
| Davenport, Iowa | — | 2.39 |
| Dayton, Ohio | — | 2.48 |
| Denver, Colo. | .63¾ | 2.55 |
| Detroit, Mich. | — | 2.25‡ |
| Duluth, Minn. | — | 2.19 |
| Indianapolis, Ind. | — | 2.41 |
| Kansas City, Mo. | .51¾ | 2.07 |
| Los Angeles, Cal. (less 5c dis.) | .63 | 2.60 |
| Memphis, Tenn. | — | 2.60 |
| Milwaukee, Wis. | — | 2.25@2.35‡ |
| Minneapolis, Minn. | — | 2.42 |
| Montreal, Canada (sks. 20c ext.) | — | 1.90a |
| New Orleans, La. | — | 2.40 |
| New York, N. Y. | .54 | 2.25† |
| Peoria, Ill. | — | 2.37 |
| Philadelphia, Penn. | .58 | 2.31@2.41 |
| Phoenix, Ariz. | .82½ | 3.65 |
| Pittsburgh, Penn. | — | 2.19 |
| Portland, Ore. | — | 3.05 |
| San Francisco, Cal. | .65¾ | 2.31* |
| St. Louis, Mo. | .57¾ | 2.30 |
| St. Paul, Minn. | — | 2.42 |
| Seattle, Wash. (10c bbl. dis.) | — | 2.65 |
| Toledo, Ohio | — | 2.40 |

NOTE—Add 40c per bbl. for bags.

*5c cash disc 10 days.

†Less 10c 10 days.

‡Prices to contractors, including bags.

(a) Less 10c 20 days.

Mill prices f.o.b. in carload lots, without bags, to contractors.

| | Per Bag | Per Bbl. |
|--------------------|---------|----------|
| Buffington, Ind. | — | 1.95 |
| Concrete, Wash. | — | 2.60 |
| Dallas, Texas | — | 2.50 |
| Fordwick, Va. | — | 2.05 |
| Hannibal, Mo. | — | 2.05 |
| Hudson, N. Y. | — | 2.05 |
| Kingsport, Tenn. | — | 2.05 |
| Leeds, Ala. | — | 1.95 |
| Louisville, Ky. | .64¾ | 2.45 |
| Nazareth, Penn. | — | 1.95 |
| Northampton, Penn. | — | 1.95 |
| Steelton, Minn. | — | 2.00 |
| Universal, Penn. | — | 1.95 |

Cement Products

Hawthorne tile, carload lots, f. o. b. plant.

| | Cicero, Ill. Per sq. | Ft. Worth, Tex. Per sq. |
|---------------|----------------------|-------------------------|
| Silver gray | — | 8.00 |
| Red French | 9.50 | 9.00 |
| Green French | 11.50 | 10.00 |
| Red Spanish | 12.00 | 9.00 |
| Green Spanish | 14.00 | 10.00 |

| | Cicero | Ft. Worth |
|----------------------|-----------|-----------|
| Ridges | .25 .35 | .25 .30 |
| Hips | .20 .30 | .14 .17 |
| Ridge closers | .05 .06 | .06 .06 |
| Hip terminals, 3 way | 1.25 1.50 | 1.00 1.25 |
| Hip starters | .50 .60 | .22 .25 |
| Gable finials | 1.25 1.50 | 1.00 1.25 |
| Gable starters | .20 .30 | .14 .16 |
| End bands | .20 .30 | — |
| Eave closers | .06 .08 | .06 .06 |

Gypsum Products—CARLOAD PRICES PER TON AND PER M SQUARE FEET, F. O. B. MILL

| | Crushed Rock | Ground Gypsum | Agri-cultural Gypsum | Stucco and Gauging Plaster | Wood Fiber | White Gauging | Sanded Plaster | Keene's Cement | Trowel Finish | Plaster Board— ½x32x36" Weight 1500 lb. Per M Sq. Ft. | Wallboard. ½x32x36" Weight 1850 lb. Per M Sq. Ft. | Wallboard. ¾x32x48" Lengths 6'-10", 1850 lb. Per M Sq. Ft. |
|------------------------|--------------|---------------|----------------------|----------------------------|------------|---------------|----------------|----------------|---------------|--|--|---|
| Agatite, Texas (a) | — | — | 6.00 | 10.00 | 10.50 | 10.00 | — | 19.00 | — | 19.375 | 20.00 | 30.00@32.00 |
| Akron, N. Y. (a) | 3.00 | 4.00 | 6.00 | 10.00 | 10.00 | 10.00 | 7.00@9.00 | 27.35 | 21.00 | 19.375 | 20.00 | — |
| Blue Rapids, Kans. (a) | 2.50 | 4.00 | 6.00 | 10.00 | 10.50 | 10.00 | — | 23.15 | 19.00 | 19.375 | 20.00 | — |
| Douglas, Ariz. | — | — | 7.00 | 16.50 | — | 19.50 | — | — | 15.50 | — | — | — |
| Ft. Dodge, Iowa (a) | 2.50 | 4.00 | 6.00 | 10.00 | 10.50 | 15.45 | — | 22.70 | 20.00 | 19.375 | 20.00 | 30.00 |
| Grand Rapids, Mich. | 2.65* | 6.00† | 6.00† | 7.00‡ | 10.00 | 19.25 | — | — | — | 19.375 | 20.00 | 30.00 |
| Gypsum, Ohio (a) | 2.75 | 4.00 | 6.00 | 10.00 | 10.00 | — | 7.5a | 26.85 | 19.00 | — | — | — |
| Hanover, Mont. | — | — | 11.80 | — | — | — | — | — | — | — | — | — |
| Port Clinton, Ohio | 3.00 | 4.00 | 6.00 | 8.00 | 9.00 | 21.00 | 7.00 | 30.15 | 20.00 | — | 20.00 | 30.00 |
| Portland, Colo. | — | — | 10.00 | — | — | — | — | — | — | — | — | — |
| San Francisco, Calif. | — | — | 9.85 | 14.40 | 15.00 | 15.40 | — | — | — | — | — | — |
| Winnipeg, Man. | 5.50 | 5.50 | 7.00 | 13.50 | 15.00 | — | — | — | — | 28.50 | — | 34.00 |

NOTE—Returnable Bags, 10c each; Paper Bags, 1.00 per ton extra (not returnable).

*To 2.75; †to 8.00; ‡to 10.00; §to 12.00; (a) prices are net of bags.

New Gravel Plant at Covington, Indiana, Nears Completion

THE new plant of the Inter State Gravel Co. at Covington, Ind., costing about \$100,000, is nearing completion. This plant is located near the old one of the same company and when in operation will have a capacity of 75 carloads per day.

Modern machinery in the way of screens and crushers are being installed and electric power will be purchased from the city.—*Danville (Ill.) News.*

Gravel Company Builds New Plant at Tacoma, Wash.

THE State Gravel Co., Tacoma, Wash., is building a new plant along the bay north of Chambers creek on land which it recently leased. The equipment for the new plant has been purchased and 25 men are now employed installing the machinery, including screens, motors, hoists, draglines and the like. The company will build a tunnel under the Northern Pacific railroad tracks to the wharves on the bay front which are being built.

The plant is expected to be in operation, according to the *Tacoma (Wash.) Tribune*, by May 1. W. R. Nichols is president of the company.

Virginia Sand and Gravel Companies Combine

THE Norfolk Sand and Gravel Co., which was recently incorporated at Norfolk, Va., has taken over the plants and properties formerly owned and operated by the Hampton Roads Sand and Gravel Corporation, according to the *Norfolk (Va.) Ledger-Dispatch*.

The company, organized with a capital of \$500,000, will be affiliated with the Arundel Corporation and the Richmond Sand and Gravel Corporation, and will immediately rehabilitate the old plants and enlarge according to the needs of that vicinity.

The daily output of the combined plants to be controlled by the company is estimated at 3000 tons and deliveries will be made by rail, water and truck.

The company has been organized with Robert Tracy, president; J. M. Umstadter, secretary and treasurer and managing director.

Alsen Cement Plant Sold for \$500,000

THE Alsen plant of the Hudson Portland Cement Co., at Catskill, N. Y., was sold at auction for \$500,000, the minimum bid set by the receiver. The purchase was made by Robert M. Johnson, rumored to represent the Rosoff Engineering Co., of New York, according to the *Hudson (N. Y.) Star*. The plant has been idle for some time and cost about \$1,000,000.

Sacramento Sand Co. Plans \$100,000 Improvements

IMPROVEMENTS which will total approximately \$100,000 are to be made soon at the sand and mortar plant of the Sacramento Mortar and Sand Co. on the American river in Sacramento, Calif. This announcement follows the filing of new articles of incorporation by that company under the name of the Western Building Material Co. The new corporation, headed by Harry and Herbert Simpson, is incorporated for \$300,000 capital stock and takes over the business and properties of the old company. Work will start at once on a new plant adjoining the sand plant for the manufacture of mortar for plaster, concrete and brick. Machinery will be installed soon and delivery of ready-mixed materials will be started on completion of the plant. The company also plans to get a rail connection to enlarge the sales field.

Others interested in the new company are: Will Thomas, R. E. Sweet and G. L. Popert, all of Sacramento.

Protest California Crushed Rock Rates

THE Union Rock Co. and American Crushed Rock Co., both having their principal place of business in Los Angeles, Calif., have filed complaints with the railroad commission against the Atchison, Topeka & Santa Fe Railway Co. alleging that defendant carrier is collecting excessive rates for the transportation of crushed rock and gravel between points in Los Angeles county and the plants of complainants at Butler and at Claremont, and between those plants and points in San Bernardino and Riverside counties.—*Los Angeles (Calif.) Commercial News.*

Pennsylvania Power Case Decided Against Cement Companies

THE Superior court of Pennsylvania decided the case of Alpha Portland Cement Co., et al., appellants, versus public service commission of Pennsylvania, affirming the order of the public service commission and dismissing the appeal at the cost of the appellants, according to the *Easton (Penn.) Express*.

The Alpha, Nazareth, Pen Allen and Allentown Portland Cement Companies had filed a protest with the public service commission charging that the price charged by the Lehigh Electric Co., now the Pennsylvania Power and Light Co., for furnishing power to the respective cement plants, was excessive. The commission sustained the electric power company, so the cement companies appealed to the state Superior court and the above decision resulted.

Graham Bros., Inc., New Sand and Gravel Plant

THE first unit of the Graham Bros., Inc., washed sand and gravel plant at Harbor City, Calif., was completed recently and is now in full operation.

This plant replaces the old sand plant which the same organization has operated on that site since 1920, and has a capacity of 600 cu. yd. of washed product per day. The sand is excavated by two 1-yd. dragline buckets operated by hoists. The sand from the buckets is conveyed to the top of a 65-ft. tower by a 14-in. belt conveyor. Water for washing the sand is pumped through a 6-in. pipe 2500 ft. long.

John Jergenson, formerly manager of the company's plant at Signal Hill, Calif., is in charge. Graham Bros., Inc., operate plants near Avalon on Catalina Island, Calif., and produce 1,000,000 tons of crushed rock annually.

Missouri Rock Asphalt Plant in Operation

THE experimental plant of the National Asphalt Co. at Deerfield, Mo., has begun operation, according to a statement, quoting P. C. Hansen, president of the company, in the *Nevada (Mo.) Mail*. Tests on the company's product were reported as very satisfactory and the product will be placed on the market at \$7 per ton.

Uvalde Rock Asphalt Company Enlarging Plant

Machinery for the large electric plant and other units of the Uvalde Rock Asphalt Co., at Cline, Texas are being rapidly installed, as building progresses. There are three 200-hp. Fairbanks-Morse Diesel engines of the latest type, which will supply power for the crushers, air compressors, machine shop units and pumps. R. D. Smith, resident manager, said that at this season the plant is not working at full capacity, but is getting out about 10 cars a day, which later will be increased to 20. The power plant is expected to be ready in about a month. Several new houses for workmen are under construction.—*San Antonio (Tex.) Express.*

Greenbrier Quarry Company Builds Cement Block Plant

A NEW concrete building block factory will begin operations at Cumberland, Md., by April 1. This plant will be owned and operated by G. Clinton Uhl and associates, who also own and operate the Greenbrier Quarry Co., and limestone from the quarry will be used as aggregate in the manufacture of the blocks.

Several buildings will be erected and modern machinery installed and the plant will have a capacity of 1200 to 1500 blocks per day. Steam will be used in curing.

New Machinery and Equipment

A New Vibrating Screen

THE Leahy "No Bind" screen belongs to that class of screens in which the frame is stationary and the screen fabric is vibrated. The screen cloth is held taut in a steel frame and kept taut by means of tension bolts. The vibrating mechanism is mounted above the screen frame and consists of a "quick return" mechanism, the motion of which is transferred to the screen fabric by a rigid member. This member is fastened to a bar on the underside of the screen cloth, across the screen but leaving the sides free to vibrate.

The normal amplitude of the vibrations is about 1/16-in. At the upper end of the screen the vibration is just enough to stratify the material fed so that the finer material works down to the screen cloth. This greatly increases the capacity of the screen over that of an unvibrated screen.

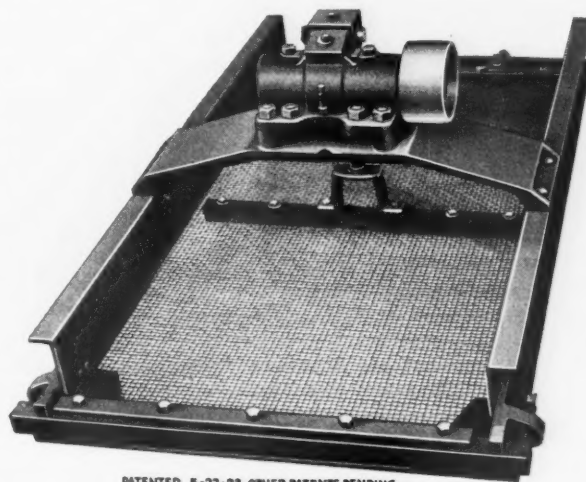
When run at 200 r.p.m. the screen vibrates 1600 times per minute. As the motion is differential, the upward stroke is slower than the downward and this is said to aid greatly in the screening.

The 3 ft. x 6 ft. Leahy screen is said by the manufacturers to have the following capacities, figured conservatively, on screening tests with dry crushed rock, slag or similar dry materials.

| Thru | Undersize product per hr. |
|-----------|---------------------------|
| 20 mesh | 7 tons |
| 16 mesh | 8 tons |
| 10 mesh | 9 tons |
| 5 mesh | 12 tons |
| 3 mesh | 15 tons |
| 2 mesh | 20 tons |
| 3/4" mesh | 30 tons |

The weight of the screen complete is 850 lbs. and the power required is from 1/4 to 1/2 h.p.

The screen is made by the Deister Concentrator Co., Fort Wayne, Ind., which has a long record of achievement in metallurgical operations.



PATENTED 5-22-23. OTHER PATENTS PENDING

New vibrating "no bind" screen

New Models in Shovels

THE Northwest Engineering Co., 28 East Jackson boulevard, Chicago, builders of cranes, draglines, and shovels, have made some changes in their line of crawler equipment.

The Model No. 104 will hereafter be a 1 1/8-yd. shovel, a 12-ton crane, a 1-yd. dragline or a pull-shovel with a 42-in. dipper. These machines will have 24-in. treads, 15 ft. in length, assuring a broad bearing surface and greater stability.

Like all Northwests, they are shipped without any dismantling and are convertible without any change in the basic machinery.

The Model No. 105 is designed as a 7/8-yd. shovel (3/4-yd. struck), a 10-ton crane, a 3/4-yd. dragline, and a trench pull-shovel with a 33-in. dipper.

This machine is equipped with 20-in. treads and, like the No. 104, it is shipped without dismantling.

All models are controlled by one man, who performs all operations from the seat on the cab deck, and the "feather-touch" lever control is standard equipment.

New Porous Concrete Invented by a Norwegian

ACCORDING to a news item in the *Washington Post* an architect at Horton, Norway, has reported the invention of a new cheap porous building material to the American Chemical Society. The report says:

"The raw materials are mainly cement, lime and ashes from bituminous alum slate used for burning the lime. The ashes are ground very finely with lime and are then mixed with the necessary amount of cement and a substance forming gas when mixed with water.

"After mixing with water the mass is cast into low-walled molds, which are filled only half full. After some time the mortar begins to rise and soon will reach the levels of the molds.

"It is allowed to harden somewhat and is then cut by a convenient machine into bricks of suitable shapes and sizes, which are finally hardened like the ordinary concrete bricks. It has a crushing strength of approximately 30 kilograms per square centimeter (420 lb. per sq. in.) and a very high insulative power against heat and sound."



New convertible shovel with 1 1/8-yd. dipper

History of the Portland Cement Industry in the United States*

By Robert W. Lesley in Co-operation with John B. Lober and George S. Bartlett—
Reviewed by Dr. Oliver Bowles, Director, U. S. Bureau of Mines, Non-Metallic Experiment Station, New Brunswick, N. J.

THE rapid and tremendous growth of the portland cement industry to its present commanding position among construction materials is one of the most interesting romances in American industry. From a few barrels produced by David O. Saylor in 1870, burned in an upright kiln and ground with buhr stones, production had grown to over 137 million barrels in 1923, valued at about \$260,000,000. The book just issued traces step by step the history of this remarkable growth. The publication is of special value in the literature of cement, because its author, Robert W. Lesley, was himself one of the pioneers who struggled against almost insurmountable difficulties, first in introducing foreign cement in America, and later in building up the domestic industry through better organization and technical improvement. After the Foreword, written with the versatile pen of Floyd W. Parsons, the chapters present successive phases in the growth of a new industry. Though the name might suggest it, the book is not the dry history of a commodity—it presents numerous interesting character glimpses of the sturdy pioneers, many of them personal friends and co-workers with the author. It must be noted with regret that John B. Lober, who co-operated with Mr. Lesley in the compilation of this history, and who was for many years president of the Vulcanite Portland Cement Co., passed from this sphere of activity almost simultaneously with the release of the book by the publishers.

The history begins with the pioneers in natural cement, Smeaton and Parker. The growth of water transportation demanding canal construction, really forced attention upon natural cement, and led to its manufacture in various canal districts. The value of high temperature calcination of a mixture of calcareous and argillaceous materials is attributed to Joseph Aspdin, an Englishman, who gave the name, portland cement, to the product in 1824. An impartial review is given of the accomplishments of other early workers on portland cement, with a brief account of what each contributed. Imported cement played an important part in the history of the domestic industry. In one respect it was advantageous, for it introduced the product to American builders, and thus paved the way for future markets. However, the high reputation it won, and the low trans-Atlantic freight rates, much of it coming as ballast in sailing ships, made it very difficult for American manufacturers to

break into the market already established. David O. Saylor was the first to patent and produce commercially in America a portland cement corresponding to the imported cement. His plant was near Copley, Penn. Other producers in the early seventies were Thomas Miller and his sons at South Bend, Ind.; John K. Shinn at Wampum, Pa.; William Loyd at San Antonio, Texas, and Robert W. Lesley, the author of this book, at Egypt, Penn.

The following brief account of Shinn's process is indicative of the difficulties, as well as the high costs, involved in early manufacture. As no crushing or grinding machinery was available near-by, carloads of rock were sent to Leetonia, Ohio, for crushing, returned to Newport near Wampum and ground with a set of buhr stones placed in the corner of a sawmill. The ground stone was taken to a brickyard, mixed with blue clay, shaped in firebrick molds, and dried. The bricks were then taken to Wampum, placed in an upright kiln with layers of coke, and calcined. After burning, the bricks were shipped to a foundry in Newcastle, Penn., where they were ground with buhr stones. When this tedious process is compared with the wonderfully efficient methods of the modern plant, turning out 7,000 barrels or more of cement per day, one realizes what tremendous strides have been made in less than 50 years.

Two chapters are devoted to the growth and development of the industry during subsequent years in the face of keen competition with imported portland cement and American natural cement. The evolution of mechanical equipment such as the rotary kiln, the Gates crusher and the Griffin grinding mill, constitute an important chapter in such development. Conservation of labor was necessary in order to meet low European costs, and this was accomplished chiefly by use of a continuous process kiln using powdered coal.

The later chapters deal with the pioneers in salesmanship, the growth of standard specifications, and the tremendous expansion of the industry subsequent to 1895, when, up to 1906, production nearly doubled every two years. The last chapter comprises a history of cement activities during the war period. Four appendices cover: (A) the history of the Portland Cement Association; (B) a brief history of the industry by years; (C) historical notes on the various cement companies; (D) standard specifications and tests. The book is worthy of a place on the shelf of everyone either directly or indirectly interested in cement.

Book Review

CONCRETE PRODUCTS: Their Manufacture and use. By Wallace R. Harris, managing editor, "Concrete Products." Second edition. 6 7/8 x 4 3/4 in. 638 pp. Illustrated. Published by the International Trade Press, Inc., Monadnock Block, Chicago.

THE author has for several years been prominently identified with the cement products industry, recently as president of the Concrete Products Association. His book is undoubtedly the most complete and authoritative treatise on the subject available and will prove helpful to products manufacturers and prospective manufacturers.

A brief outline of the book can be obtained from a summary of the chapter headings: Concrete products as a business; selling; exhibiting; service to contractors; materials used; plant layout and equipment; types of block machines; types of block; standard block and tile sizes; hollow building tile; concrete brick; chimney block; steps; sills, lintels and trimstone; architectural trimstone; floor tile; floor units; roofing tile; cement asbestos shingles; ornamental concrete products; plaster and glue molds; working details of form construction for drinking fountain; forms and molds for special products; surface finish; mortar colors; laundry trays; garbage and ash receptacles; septic tanks for sewage disposal; bath tubs and flush tanks; silo staves; types of structures built with concrete staves; concrete lumber, or building units; drain tile; irrigation pipe; culvert pipe; culvert sections; sewer pipe, plain and reinforced; pressure pipe; pipe manufacturing methods; testing pipe; electrical conduits; light standards; fence posts; railroad ties; burial vaults; monuments and markers; curing concrete products; waterproofing; masonry construction; stucco on concrete block; cost of walls; cinder concrete products; porette; novocrete and woodcrete; specifications for building units; specifications for culvert pipe; for drain tile; for sewer pipe; for conduits; for stucco on concrete block; building codes and ordinances; tests; association co-operation; Portland Cement Association; American Concrete Institute; Concrete Products Association; American Concrete Pipe Association; National Concrete Stave Silo Association; National Cinder Concrete Products Association; machinery and molds; college and commercial laboratories for testing concrete products.

A mere reading of the foregoing must impress the initiated with the tremendous progress made in developing uses for portland cement and open the eyes to opportunities for local enterprises. The treatment afforded all these various subjects is necessarily brief, as a book of equal size to this might be written on almost all of them. There are, however, few superfluous words and the reader will find it easy reading and interesting.

330 pages, well illustrated. Published by International Trade Press, Inc., Chicago. Cloth, \$3.00.

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News of All the Industry

Incorporations

Midwestern Sand Co., Columbus, Ohio, \$500, by E. I. Taylor, A. M. Kirchner.

Athens Stone Co., Athens, Tenn., capital \$50,000 by R. J. Fisher, E. L. Willson.

Tennessee Bauxite Co., Chattanooga, Tenn., \$100,000 by J. M. Alper and L. Meyer.

Spring Gravel Co., Crookston, Minn., capital \$50,000, by Elbert W. Spring and others.

Big Bend Quarry Co., Wilmington, Del., capital \$50,000. (Corporation Trust Co. of America).

Standard Rock Asphalt Co., Kansas City, Mo., capital \$50,000 by A. H. O'Conner, H. H. Murlin.

George A. Simpson, Burbank, Cal., has engaged in business at Roscoe, Cal., as Independent Rock & Sand Co.

Opaline Granite Co., Austin, Texas, capital stock, \$250,000 by J. L. Arlitt, Max J. Werkenstien and E. von Kalow.

Winnsboro Granite Corporation, Dillon, S. C., capital \$210,000, by R. G. Rhett, president, E. H. Sparkman, secretary.

Florida Duntile Manufacturing Co., Lake Worth, Fla., capital \$50,000 by C. A. Jensen, president Ella S. Jensen, secretary.

Spanish Tile and Import Co., Miami, Fla., capital \$10,000, by Cyrus F. Wicker, president, Lucy S. Wicker, secretary.

Tilette Cement Co., New York, capital \$10,000 by L. Urbach, J. H. Kalbe, G. H. Raymond. (Attorneys, Williams and Urbach).

Hudson Stone Co., Knoxville, Tenn., capital stock \$5,000 by E. B. and T. O. Hudson, F. O. and Mrs. Ella Loft, P. E. Atkins.

Prince Concrete Co., Camden, N. J., capital \$100,000 by George C. George R., and Phillip H. Prince. (Attorney J. S. Low).

S. H. Hicks & Son, Inc., Lansing, Mich., capital \$15,000, to handle building material and manufacture cement building blocks.

Farmingdale Gravel and Concrete Products Co., Inc., Brooklyn, N. Y., has changed its name to the Farmingdale Sand and Gravel Co., Inc.

Beverly Sand and Stone Co., Knoxville, Tenn., has changed its name to Holston Quarry Co., and increased its capital from \$50,000 to \$100,000.

Lancaster Sand and Gravel Co., Buffalo, N. Y., \$25,000, W. J. Weinand, F. Felts, H. A. Walter. (Attorneys Donovan, Ratchle and Depew, Buffalo).

Rock Block Corporation, Rochester, N. Y., cement products, 100 shares common stock, no par, by R. H. Field, H. A. Baldwin, M. H. Green.

Western Gravel Co., Westfir Ore., recently incorporated, has contract to furnish gravel to Southern Pacific R. R. and has begun operations at a gravel pit at the mouth of the Northfork river.

Albert J. Ward Co., Chicago, capital \$25,000, quarry, manufacture and sell stone, concrete, lime. Incorporators, Albert J., Harold G., and Margaret G. Ward.

Rosoff Subway Construction Co., Inc., Manhattan, N. Y., capital \$500,000 by S. R. Rosoff. Will do general contracting, quarrying and construction.

Diamond Block Co., St. Paul, Minn., by Elliott Magraw and others, for the manufacture of cement block, brick, tile and other cement products.

Emil F. Masil and associates, Los Angeles, Cal., will engage in the rock crushing business at the mouth of Haines Canyon, as the Haines Canyon Rock Co.

Maple Shade Concrete Co., Camden, N. J., \$30,000 by John Poyje, of Maple Shade; Joseph S. Low and Helen V. Allgaier, of Camden. (Attorney Joseph S. Low).

Duntile System, Buffalo, N. Y., capital \$25,000, to manufacture cement blocks. Incorporated by H. C. Hertz, J. J. McKay, G. C. Lippke. (Attorney E. C. Cornblum, Buffalo).

Superior Rock Products Co., Los Angeles, Cal., capital stock of \$500,000, by A. Humphreys, South Pasadena, G. G. Graves, E. W. Shaw, George Halverson and C. S. Price of Los Angeles.

Central Gravel Co., Waco, Texas, capital \$39,990 by T. A. Griffin, president; W. C. Woodlock, vice president; R. D. Sterne, secretary and treasurer. The plant is located two miles from Waco, on the Dallas road.

East Peoria Sand and Gravel Co., 315 Broadway, Peoria, Ill., capital, \$16,000, will handle sand and gravel, manufacture and deal in concrete products, by John and Ethel F. Gibbons, and G. G. and Marie Ziegle.

Newport Gravel Corporation, Newport News, Va., capital stock \$5000 to \$50,000, by T. B. Clifford, president, O. M. Palmer, secretary, Allan D. Jones, W. J. Nelms and L. A. McMurran, all of Newport News. Will produce and deal in sand and gravel.

Cinder Concrete Products Corporation, Milwaukee, Wis., has been organized with 5,000 shares of no-par common and \$15,000 preferred stock to manufacture building blocks and other materials out of cinders. A site has been acquired for a plant costing about \$120,000. Later six smaller branches will be established in large centers in Wisconsin. The incorporators are: W. C. Wehe, W. M. Lewis and Lloyd E. Pitner of Racine, Wis.

Sand and Gravel

Glasgow Sand Co., Glasgow, Mo., is reported to plan the enlarging of its plant.

The Flesher Gravel Co.'s plant at Shawneetown, Ill., was destroyed by fire with a loss of several thousand dollars not covered by insurance.

Colorado Sand and Gravel Co., Smithville, Texas, is building a spur track connecting the plant with the M. K. T. Ry.

Lyman-Richey Co., Bridgeport, Neb., is reported to be installing a new electrical power system at its sand plant.

Smoot Sand and Gravel Co., Washington, D. C., is having a new tug boat built. The boat has a 58-ft. hull and will be equipped with a 165-hp. Diesel engine.

J. H. Hobson of Hattiesburg, Miss., has acquired 400 acres of sand and gravel in Carroll county and will install screening and washing plant to develop.

Greenville Gravel Co., Urbana, Ohio, operations recently uncovered some human bones, that had been interred about 100 years, when removing the surface of some new area.

Pioneer Sand and Gravel Co., Seattle, Wash., is using two special trucks for the delivery of its ready mixed concrete, which the company is selling under the name of "True Mixed."

East End Sand and Gravel Co., Chillicothe, Ohio, will rebuild and extend its plant, giving it an output of from 1000 to 1500 tons daily. The company also plans to obtain railroad connections.

Port Crescent Sand and Fuel Co., Port Crescent, Mich., is reported to plan the installation of improved sand-loading and conveying machinery estimated to cost \$75,000. Floyd Schubel is manager.

W. D. Miller and Elmer Childers are building a new rock crushing plant near Medford, Ore., at a cost of \$10,000. Will supply Medford and vicinity with washed sand and gravel and crushed rock.

Arkansas City Gravel Co., Arkansas City, Ark., has completed mile of standard railroad track running from its gravel beds to the washing and loading plant on the Missouri Pacific R. R. north of Silverdale.

Hause Washed Sand and Gravel Corporation, has installed a 6-in. dredge at its plant at Wayside, N. J. Fred Hause is president of the company. Allen Hueth is secretary and Claude R. English is treasurer.

Clarence F. Pratt, president of the Pratt Building Material Co., San Francisco, Calif., reports leasing the company's sand and rock bunkers at Fifteenth and A streets, Sacramento, Calif., to the Atlas Mortar Co., of San Francisco. These bunkers have been operated during the last five months by the Ehret Rock and Gravel Co.

Quarries

Union Pacific Coal Co., Rock Springs, Wyo., will enlarge its rock crushing plant according to reports.

A stone quarry has been opened on Dry Gap pike several miles west of Knoxville, Tenn., by the county road department to furnish crushed rock for road building.

The Perry County Arkansas rock crusher was sold to R. S. Harris, a local road contractor recently and moved to Perryville, Ark., according to a local paper.

Hale Beerbower and Charles Buel have purchased a stone quarry at Rockford, Ohio, accord-

ing to a local paper, and will begin quarrying and crushing operations soon.

Buckeye Stone Co., Tehuacana, Texas, B. P. Panas, president, reported to expend \$50,000 on plant to produce rock for road building and lime for fertilizers.

Linn county has taken over the city's interest in the rock crushing plant at Harrisburg, Ore., the consideration amounting to about \$1,500. The plant will be improved so as to have a capacity of 75 yards a day at a cost of about 75 cents per yard.

Residents near the quarry of the Commercial Rock Crusher Co., Kansas City, Mo., are complaining of the blasts in the quarry and the rock dust settling in the neighborhood. G. S. Landrey has filed a suit against the company, a local newspaper reports.

The board of county commissioners at a meeting in Louisville, Ky., voted to advertise for bids on new equipment for the county quarry near Edwardsville, Ky., for which \$6,000 has been appropriated. Equipment to be purchased includes a stone crusher, 75 hp. motor, three steel cars with tracks and switches, and a No. 2 jackhammer with 25 ft. of hose, together with the erection of a rock bin.

Plans for the new marble quarry near Ontario, Calif., call for the addition of a rock crushing plant to utilize the broken pieces of rock quarried. The company is financed by Los Angeles capital. J. P. Brodie stone quarries at Lyons, Colo., have been leased to Doolings Bros., Denver, Colo., with an option to purchase the property. About \$50,000 worth of new machinery will be installed to produce crushed rock to be used in concrete work.

Cement Products

William Hafeman, Long Prairie, Minn., bought the interest of his partners in the cement block factory there.

Louis R. Robinson, St. Louis, Mo., has purchased a five acre site and will erect a concrete building block factory.

Trinity Concrete Products Co., Kingston, N. C., has a new plant on E. North street, Alfred J. Ashford and A. Cheney are in charge.

Cambridge Cement Stone Co., Brighton, Mass., has awarded a general contract for the construction of a one-story addition 45x250 ft to cost \$37,000 with equipment.

Bud Reed is building a new plant at Stillwell, Okla., for the manufacture of concrete tile of all sizes. Part of the machinery has arrived and been installed in the plant.

Manufacturers of cement products in Texas met in Waco recently to form a state organization. F. A. Winchell, of Waco, was chosen temporary chairman of the meeting and R. L. Jolly, of Dallas, temporary secretary.

Ajax Concrete Products Co., has secured and is remodeling one unit of the James Clark Distilling Co.'s property at LaVale, Md., and will install machinery for the manufacture of concrete products. The plant according to a local paper will be in operation by March 15.

Massey Concrete Pipe Co.'s plant at Montgomery, Ala., is busy on a number of culvert pipe contracts for railroads. H. G. Higgs, with office at Atlanta, is southern sales manager. Neil McGaffey is superintendent of the Montgomery plant.

Toulmin Concrete Pipe and Tile Co., Mobile, Ala., has installed additional equipment in its plant and increased its capacity from 1,500 to 3,000 pieces per day. A contract to furnish concrete hollow tile for a new high school and Mobile representing about six months output is the immediate cause of the plant's growth.

Canadian Concrete Products Co., Belleville, Ont., a subsidiary of the Massey Concrete Products Co., Chicago, has purchased 22 acres at Belleville and will start on a plant this month for the manufacture of concrete culvert and sewer pipe and concrete posts. C. K. Harrison is the manager of the new concern.

California Association of Concrete Pipe Manufacturers will hold a convention in Stockton, Calif., on March 28. Fred Berman, of the Atlas Rock Co., and Fred Spiekerman, of the Spiekerman Concrete Pipe Co., have been named a committee to make arrangements for the meeting. Between 75 and 100 members manufacturers of concrete pipe will be in attendance.



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Cement

Dixie Portland Cement Co., Richard City, Tenn., is to expend \$200,000 on improvements, work consists of replacing present engine drives and d. c. motors by a. c. motors.

Sandusky Cement Co., Cleveland, Ohio, held its annual sales conference at Cleveland at which over 50 sales representatives were present. A. T. McCormack, sales manager, outlined the sales policies for 1925 and G. W. Cole, assistant sales manager, detailed the traffic and delivery situation. L. E. DeCamp, district sales manager in Illinois, told of the development of the Dixon territory.

Lime

Osceola Lime Co., Osceola, Mo., have purchased the old water tower at Carrollton, Mo., and are moving it to the plant in Osceola. The tower is 111 ft. high and has a capacity of 110,000 gallons.

Western Lime and Cement Co., Green Bay, Wis., is adding two new units to its plant and they will be in service soon. A new screening plant is planned to screen the dust out of the limestone before burning to assure better draft in the kilns.

Fred Borts has purchased a tract of land five miles south of Placerville, Calif., and has started a kiln to manufacture quick lime for agricultural purposes. He expects to purchase a rock crusher later and furnish crushed limestone to farmers as well.

Gypsum

Plastergon Wall Board Co., Buffalo, N. Y., will erect a new plant of two one-story units 150x200 ft., at a cost of \$250,000 to replace the plant recently destroyed by fire.

United States Gypsum Co., Chicago, is contemplating the expenditure of approximately \$40,000 for new office and store house additions to its plant at Saltville, Va.

Rock Asphalt

Cherokee Rock Asphalt Co., near Florence, Ala., has applied for permission to sell 2,000 shares of non-par value common stock at \$100 per share. The state securities commission has named a board of appraisers to make the inventory and appraisal of the properties and assets of the company.

Sand-Lime Brick

Leaside Brick and Sand Co., will establish a plant at Leaside, Ont., in about a month and remove its equipment from Hepworth, Ont.

Magnesite

Northwest Magnesite Co., Chewelah, Wash., is putting on additional crews at the Finch quarry.

Trade Notes

Gulf Contracting Co., Houston, Texas, is planning to purchase stone crushing equipment, including a jaw crusher, elevator, and conveyor.

The **Prinz Adelbert Potash Mines** in Germany were sold to H. M. May recently for \$2,052,000. It is rumored in New York papers that the buyer represented Wintershall Konzern, the largest potash operators in Germany.

Pennsylvania Crusher Co., Philadelphia, Penn., recently appointed the Stratton-Cahoon Co., 809 McIntyre bldg., Salt Lake City, Utah, district agents for the sale of its extensive line of coal preparation machinery and heavy duty primary, secondary and fine crushers for limestone, gypsum, cement rock and ores.

Personals

C. E. Williams, secretary of the United States Gypsum Co., Chicago, has been elected vice president of the company. He will continue as well in his secretarial capacity.

Herman Meier of the Davenport Cement Products Co., Davenport Iowa, was elected vice president of the Iowa Concrete Products Association at the annual convention at Ames, Iowa.

W. H. Haelig, superintendent of the Bound Brook Crushed Stone Co., Bound Brook, N. J., was married to Mabel Reed, daughter of Mrs. Lillian Messler, on Feb. 11 at Somerville, N. J.

Leo A. Poston has resigned his position as assistant to the treasurer of the Acme Cement Corporation, of Catskill, N. Y., and will be connected with the J. G. White Corporation of New York.

Lynn W. Nones has been appointed eastern sales manager for the Diamond Power Specialty Corporation, in charge of the Atlantic coast offices from Boston, Mass., to Charlotte, N. C., inclusive. His office is at 90 West street, New York.

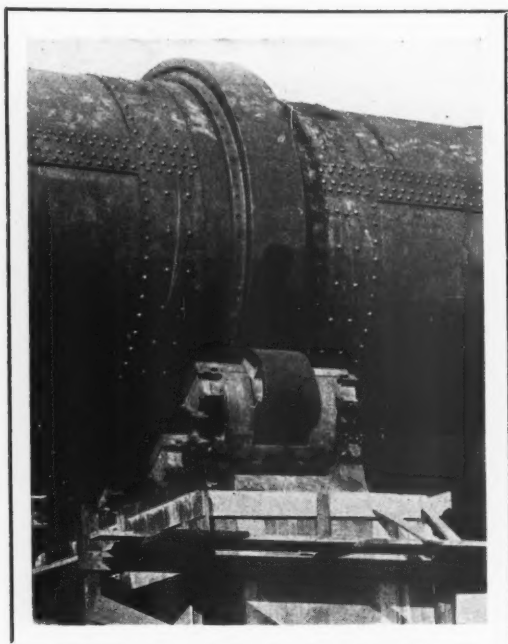
J. Morley Zander, of Saginaw, Mich., president of the Sand Lime Brick Association, recently addressed members of the Exchange club of Muskegon, Mich., on the manufacture of sand lime brick. His talk was illustrated with moving pictures.

Manufacturers

Raymond Bros. Impact Pulverizer Co., 1315 N. Branch street, Chicago, presents a pamphlet giving an example of operation service obtained from a Raymond No. O pulverizer.

Poole Engineering and Machine Co., Baltimore, Md., has lately published bulletins 105 and 106 showing its new type H and type K reducing gears respectively.

Gilman Manufacturing Co., Boston, Mass., has recently issued bulletin No. 103 covering its new automatic heat treating machines for rock drill bits. This machine is quite an innovation in the method of heat treating rock drill steel.



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